Drive^{IT} Low Voltage AC Drives

User's Manual

Input Disconnect and Bypass Configurations for ACH550 Drives (1…550 Hp)

ACH550 Drive Manuals

GENERAL MANUALS

ACH550-UH HVAC User's Manual (1…150 HP)

- Safety
- Installation
- Start-Up
- Diagnostics
- Maintenance
- Technical Data

ACH550-U2 Installation Supplement (200...550 HP)

- Safety
- Installation
- Maintenance
- Technical Data

ACH550 Input Disconnect and Bypass Supplement (1...550 HP)

- Safety
- Installation
- Start-Up
- Maintenance
- Technical Data

OPTION MANUALS

(Fieldbus Adapters, I/O Extension Modules etc., manuals delivered with optional equipment)

Relay Output Extension Module (typical title)

- Installation
- Programming
- Fault tracing
- Technical data

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Warning! The ACH550 adjustable speed AC drive with bypass should ONLY be installed by a qualified electrician.

Warning! Even when the motor is stopped, dangerous voltage is present at the Power Circuit terminals U1, V1, W1 and U2, V2, W2 and, depending on the frame size, UDC+ and UDC-, or BRK+ and BRK-.

Warning! Dangerous voltage is present when input power is connected. After disconnecting the supply, wait at least 5 minutes (to let the intermediate circuit capacitors discharge) before removing the cover.

Warning! Even when power is removed from the input terminals of the ACH550, there may be dangerous voltage (from external sources) on the terminals of the relay outputs R01…R03.

Warning! When the control terminals of two or more drive units are connected in parallel, the auxiliary voltage for these control connections must be taken from a single source which can either be one of the units or an external supply.

Warning! The ACH550 is not a field repairable unit. Never attempt to repair a malfunctioning unit; contact the factory or your local Authorized Service Center for replacement.

Warning! The ACH550 will start up automatically after an input voltage interruption if the external run command is on.

Note! For more technical information, contact the factory or your local ABB sales representative.

Use of Warnings and Notes

There are two types of safety instructions throughout this manual:

- Notes draw attention to a particular condition or fact, or give information on a subject.
- Warnings caution you about conditions which can result in serious injury or death and/or damage to the equipment. They also tell you how to avoid the danger. The warning symbols are used as follows:

Dangerous voltage warning warns of high voltage which can cause physical injury and/or damage to the equipment.

General warning warns about conditions, other than those caused by electricity, which can result in physical injury and/or damage to the equipment

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Chapter 1 – Introduction

This chapter explains the purpose and contents of this manual, intended audience, and conventions used in this manual.

How To Use This Manual

The purpose of this manual is to provide you with the information necessary to install and start-up your ACH550 with E-Bypass. This manual also explains features and functions of the E-Bypass and requirements such as external drive control connections, wiring, cable sizes, and cable routing.

The ACH550 with E-Bypass user documentation also includes the *ACH550-UH* User's Manual. Both the *ACH550-UH User's Manual* and this E-Bypass manual are required to properly install and operate the ACH550 with E-Bypass.

"Chapter 1 – Introduction", the chapter you are reading now, introduces you to this *User's Manual for the ACH550 with E-Bypass*.

"Chapter 2 – Overview of ACH550 with E-Bypass" explains drive identification and the available features and functions, and provides a detailed description of operation.

"Chapter 3 – Installation Instructions" covers E-Bypass pre-installation planning, initial inspection, mounting and electrical wiring.

"Chapter 4 – Start-up Procedure" includes safety precautions, configuration settings, installation inspection and initial start-up tests.

Intended Audience

The audience for this manual has:

- Minimal knowledge of ABB product names and terminology.
- No experience or training in installing, operating, or servicing the ACH550 with E-Bypass.
- Basic knowledge of standard electrical wiring practices, electronic components, and electrical schematic symbols.

The audience for this manual will install and start-up the ACH550 with E-Bypass. If you do not possess the skills listed above, please refer the installation to a qualified installer.

Terminal Block Nomenclature

This manual expresses specific terminal blocks and connections as a letter, a number, a colon (:), and another number. The letter and number to the left of the colon identify the terminal block, for example X1. The number to the right of the colon identifies the terminal number, for example 9. In this manual, a terminal connection numbered 9, located on a terminal block named X1, is identified as X1:9.

Warranty and Liability Information

The warranty for your ABB E-Bypass covers manufacturing defects. The manufacturer carries no responsibility for damage due to transport or unpacking.

In no event and under no circumstances shall the manufacturer be liable for damages and failures due to misuse, abuse, improper installation, or abnormal conditions of temperature, dust, or corrosives, or failures due to operation above rated capacities. Nor shall the manufacturer ever be liable for consequential and incidental damages.

The period of manufacturer's warranty is 12 months after installation, and not more than 18 months from the date of delivery.

Extended warranty may be available with certified start-up. Contact your local distributor for details.

Your local ABB Drives company or distributor may have a different warranty period, which is specified in their sales terms, conditions, and warranty terms.

If you have any questions concerning your ACH550 with E-Bypass, contact your local distributor or ABB Drives office.

The technical data and specifications are valid at the time of printing. ABB reserves the right to subsequent alterations without notice.

Chapter 2 – Overview of ACH550 with E-Bypass

This chapter explains the numbers and letters on the control nameplate, describes the E-Bypass features and provides a detailed description of operation. It also describes the E-Bypass hardware components and input/output connections.

General Information About the ACH550

Control Identification

The ACH550 with E-Bypass is a packaging arrangement that provides space for mounting factory installed options as designated by the type code characters following a plus sign (+) after the ACH550 base unit type code. Locate the Control Nameplate on the E-Bypass and use Figure 2-1 to verify the model number.

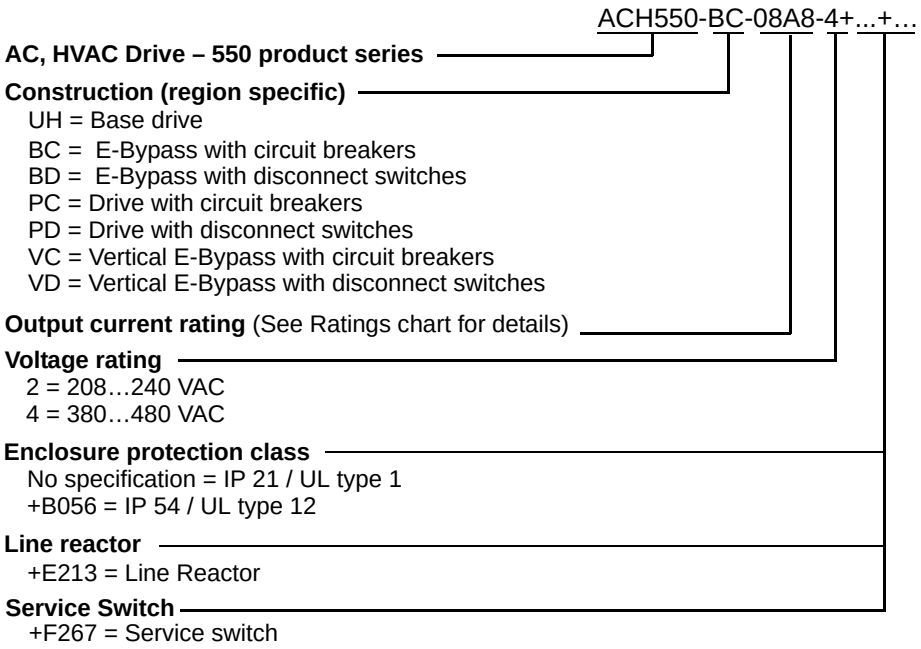

ACH550-BC-08A8-4+...+…
AC, HVAC Drive – 550 product series
Construction (region specific)
UH = Base drive
BC = E-Bypass with circuit breakers
BD = E-Bypass with disconnect switches
PC = Drive with circuit breakers
PD = Drive with disconnect switches
VC = Vertical E-Bypass with circuit breakers
VD = Vertical E-Bypass with disconnect switches
Output current rating (See Ratings chart for details)
Voltage rating
2 = 208…240 VAC
4 = 380…480 VAC
Enclosure protection class
No specification = IP 21 / UL type 1
+B056 = IP 54 / UL type 12
Line reactor
+E213 = Line Reactor
Service Switch
+F267 = Service switch

Figure 2-1 Type Code Description for the ACH550 E-Bypass

E-Bypass Features and Functions

The ACH550 with E-Bypass is an ACH550 AC adjustable frequency drive in an integrated UL type 1 or UL type 12 package with a bypass motor starter. The ACH550 with E-Bypass provides a disconnect switch or circuit breaker with door mounted operator (padlockable in the OFF position), a bypass starter, motor overload protection, a local operator keypad with indicating lights, and provisions for external control connections. An optional drive service switch (drive input disconnect) may also be provided.

Figure 2-2 shows the front view of the ACH550 E-Bypass configurations, and identifies the major components.

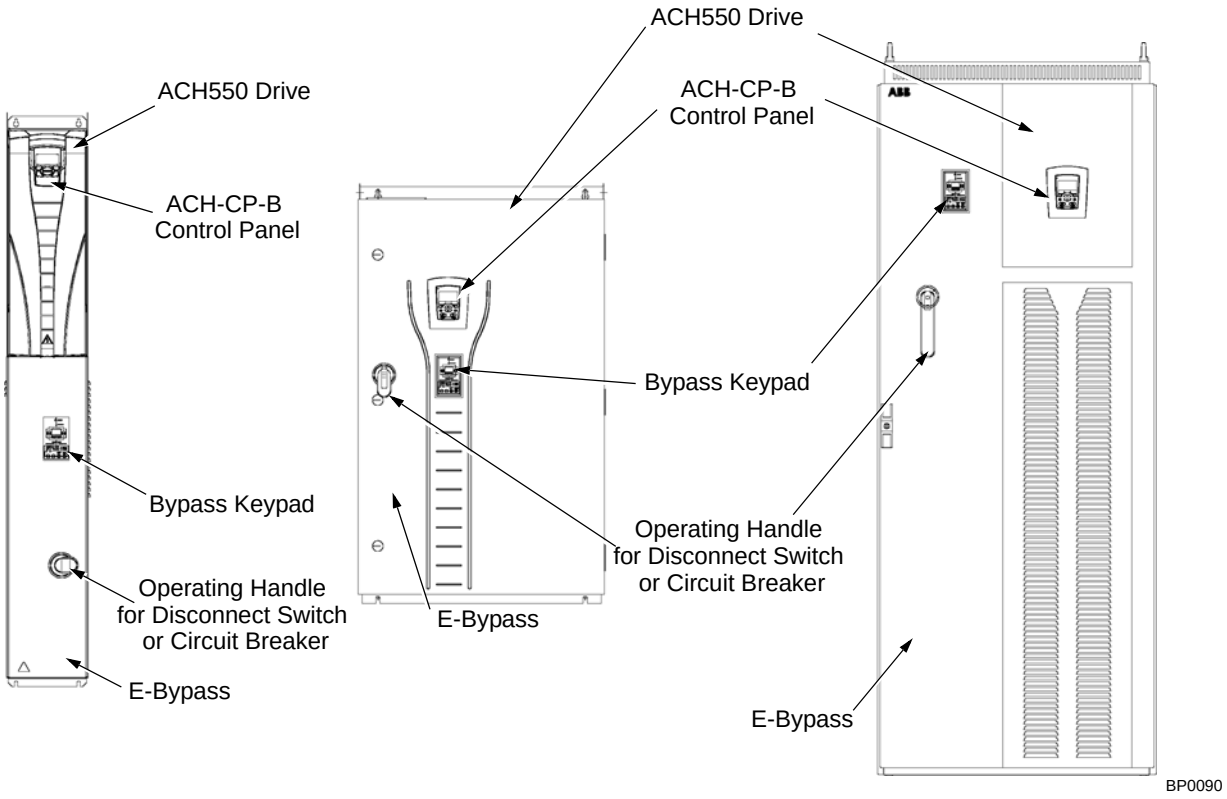


Figure 2-2 E-Bypass Configurations, Exterior View

The following is a typical power diagram.

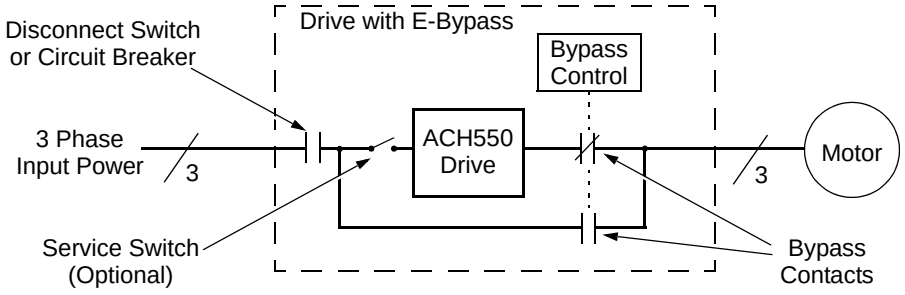


Figure 2-3 Typical Power Diagram for E-Bypass

Input Power

Input power is connected to the ACH550 with E-Bypass through a door interlocked disconnect switch or circuit breaker.

Door Interlocked Disconnect Switch

The door interlocked disconnect switch is not fused. The branch circuit that provides power to the ACH550 with E-Bypass must include appropriate motor branch circuit protective devices to provide short circuit and ground fault protection for the motor in the bypass mode.

Door Interlocked Circuit Breaker

The door interlocked circuit breaker is an optional alternative to the door interlocked disconnect switch. The circuit breaker provides short circuit and ground fault protection for the motor in the bypass mode.

Drive Input Fuses

Drive input fuses are provided to disconnect the drive from power in the event that a component fails in the drive's power circuitry. Since fast-acting fuses are provided, the branch circuit protection will not clear when the drive input fuses blow. If the drive input fuses blow, the motor can be switched to Bypass without replacing fuses or resetting a circuit breaker. The drive's electronic protection circuitry is designed to clear drive output short circuits and ground faults without blowing the drive input fuses. Drive input fuse specifications are listed in Table 2-1 and Table 2-2.

Table 2-1 208 - 240 Volt, Drive Input Fuse Rating

208 - 240 Volt		Frame Size	Drive Input Fuse Ratings	
HP	**Identification**		**Amps (600V)**	**Bussmann Type**
1	ACH550-xx-04A6-2	R1	15	KTK-R-15
1.5	ACH550-xx-06A6-2	R1	15	KTK-R-15
2	ACH550-xx-07A5-2	R1	15	KTK-R-15
3	ACH550-xx-012A-2	R1	15	KTK-R-15
5	ACH550-xx-017A-2	R1	30	KTK-R-30
7.5	ACH550-xx-024A-2	R2	30	KTK-R-30
10	ACH550-xx-031A-2	R3	40	JJS-40
15	ACH550-xx-046A-2	R3	80	JJS-80
20	ACH550-xx-059A-2	R3	80	JJS-80
25	ACH550-xx-075A-2	R4	100	JJS-100
30	ACH550-xx-088A-2	R4	125	JJS-125
40	ACH550-xx-114A-2	R4	150	JJS-150
50	ACH550-xx-143A-2	R6	200	JJS-200
60	ACH550-xx-178A-2	R6	225	JJS-225
75	ACH550-xx-221A-2	R6	350	JJS-350
100	ACH550-xx-248A-2	R6	350	JJS-350

Table 2-2 380 - 480 Volt, Drive Input Fuse Rating

380 - 480 Volt		Frame Size	Drive Input Fuse Ratings	
HP	Identification		Amps (600V)	Bussmann Type
1/1.5	ACH550-xx-03A3-4	R1	15	KTK-R-15
2	ACH550-xx-04A1-4	R1	15	KTK-R-15
3	ACH550-xx-06A9-4	R1	15	KTK-R-15
5	ACH550-xx-08A8-4	R1	15	KTK-R-15
7.5	ACH550-xx-012A-4	R1	15	KTK-R-15
10	ACH550-xx-015A-4	R2	30	KTK-R-30
15	ACH550-xx-023A-4	R2	30	KTK-R-30
20	ACH550-xx-031A-4	R3	40	JJS-40
25	ACH550-xx-038A-4	R3	40	JJS-40
30	ACH550-xx-044A-4	R4	100	JJS-100
40	ACH550-xx-059A-4	R4	100	JJS-100
50	ACH550-xx-072A-4	R4	100	JJS-100
60	ACH550-xx-077A-4	R6	125	JJS-125
75	ACH550-xx-096A-4	R6	125	JJS-125
100	ACH550-xx-124A-4	R6	150	JJS-150
125	ACH550-xx-157A-4	R6	200	JJS-200
150	ACH550-xx-180A-4	R6	225	JJS-225
200	ACH550-xx-245A-4	R7	400	JJS-400
250	ACH550-xx-316A-4	R8	400	JJS-400
300	ACH550-xx-368A-4	R8	400	JJS-400
350	ACH550-xx-414A-4	R8	600	JJS-600
400	ACH550-xx-486A-4	R8	600	JJS-600

Note: Fuses listed are similar in function to fuses listed in the *ACH550-UH User's Manual*, physical characteristics may differ. Fuses from other manufacturers can be used if they meet the ratings given in the table. The fuses recommended in the table are UL recognized.

Line Reactor

The ACH550 E-Bypass may contain optional input line reactors to provide an additional input impedance to limit the harmonics back to the power line. This impedance is in addition to the approximately 5% input impedance provided by internal reactors that are standard in the drive.

Bypass Contactors

The bypass circuit available with the ACH550 E-Bypass includes two contactors. One contactor is the bypass contactor (2M) that can be used to manually connect the motor directly to the incoming power line in the event that the ACH550 is out of service. The other contactor is the ACH550 output contactor (1M for R1 through R4 and 3M for R5 through R8) that disconnects the ACH550 from the motor when the motor is operating in the Bypass mode. The drive output contactor and the bypass contactor are interlocked to prevent "back feeding," applying line voltage to the ACH550 output terminals.

Motor Overload Protection

In the *Drive* mode, motor overload protection is provided by the ACH550.

In the *Bypass* mode, motor overload protection is provided by the bypass control board.

WARNING: If power is applied and the switches and contacts in the control circuit are commanding the motor to run, the motor will start as soon as the overload protection is reset.

Use caution when resetting the overload protection to make sure it is safe to start the motor.

Operator Control

The ACH-CP-B Control Panel is a keypad with an LCD unit that provides status indication and operator control for the ACH550 drive. In normal operation with the E-Bypass, the ACH550 should be placed in the *Auto* mode by pressing the *Auto* key on the ACH-CP-B Control Panel. Refer to the *ACH550-UH User's Manual* for additional information on the ACH-CP-B Control Panel and other aspects of ACH550 operation.

The E-Bypass has a separate keypad that is used for selecting the *Drive* or *Bypass* mode and for manually starting and stopping the motor in the *Bypass* mode. The bypass keypad has LEDs that indicate the status of both the bypass and the drive. The bypass keypad is described in detail in the *Detailed Description of Operation*.

E-Bypass Options

In addition to the line reactor and circuit breaker options described above, the E-Bypass has space for factory installation of a drive service switch (drive input disconnect). The drive service switch provides a superior implementation and functional equivalent of a three-contactor bypass arrangement.

Detailed Description of Operation

The following paragraphs provide a detailed description of the various features and functions of the E-Bypass. Circuit diagrams for this product are shipped with the unit.

Bypass Control Keypad

Figure 2-4 shows the bypass control keypad and identifies the keys and LED indicating lights. The functions of the various keys and LEDs are described in the following paragraphs.

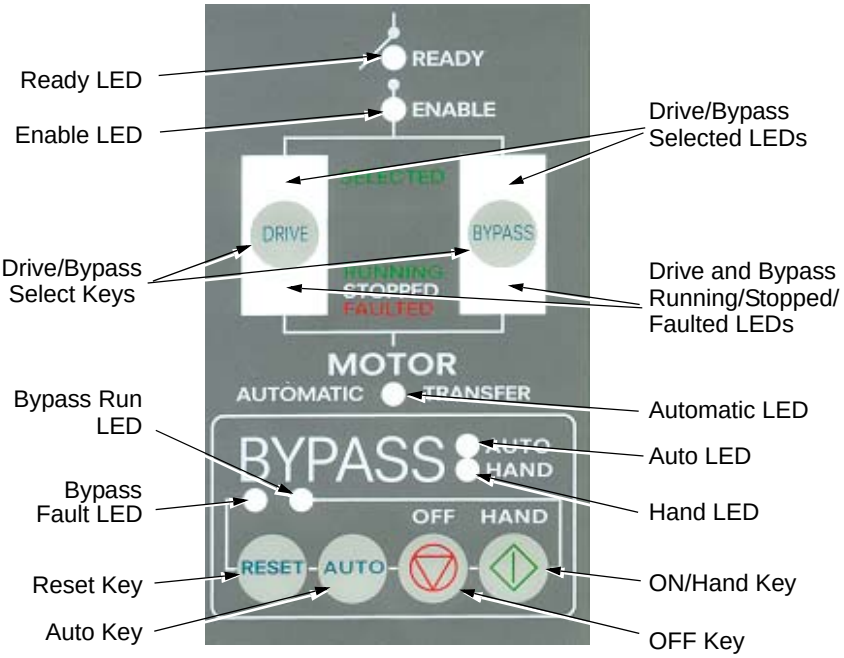


Figure 2-4 Bypass Control Keypad

Ready LED — The *Ready* LED is illuminated when the disconnect switch or circuit breaker is closed and power is applied to the ACH550 and bypass.

Enable LED — The *Enable* LED is illuminated under the following conditions:

1) Both the Safety Interlock and Run Enable contacts are closed.

2) The Safety Interlock contact is closed with no Start command present.

The *Enable* LED flashes, if the Run Enable contact is open and when the Safety Interlock contact is closed and a Start command is present.

The *Enable* LED is not illuminated when the Safety Interlock contact is open.

Drive Run LED — The *Drive Run* LED is illuminated green when the ACH550 drive is running.

Bypass Fault LED — The *Bypass Fault* LED indicates the status of the bypass overload/ underload protection. The LED is red when the bypass has tripped on an overload/underload or the bypass control board has faulted.

Drive Selected LED — The *Drive Selected* LED is illuminated green when the ACH550 drive has been selected as the power source for the motor.

Bypass Selected LED — The *Bypass Selected* LED is illuminated green when the E-Bypass has been selected as the power source for the motor.

Drive Fault LED	The *Drive Fault* LED is illuminated red when the motor or drive protection functions have shut down the ACH550.
Bypass Run LED	The *Bypass Run* LED is illuminated green when the motor is running in bypass.
Automatic Transfer LED	The *Automatic Transfer* LED is illuminated green to indicate the system has automatically transferred to Bypass after a Drive fault. The *Automatic Transfer* LED flashes green to indicate the system has been placed in an Override condition.
Auto LED	The *Auto* LED is illuminated green when the *Auto Start* contact has been selected as the means for starting and stopping the motor in the bypass mode.
Hand LED	The *Hand* LED is illuminated green when the motor has been started manually in the bypass mode.
Drive Select Key	The *Drive Select* key selects the ACH550 drive as the power source for the motor.
Bypass Select Key	The *Bypass Select* key selects the bypass as the power source for the motor.
Reset Key	The *Reset* key resets the bypass fault. It may take several minutes before the bypass can be reset after an overload trip.
Auto Key	The *Auto* key selects the *Auto Start* contact as the means for starting and stopping the motor in the bypass mode.
Hand Key	The *Hand* key can be used to manually start the motor when the bypass has been selected as the power source for the motor.
OFF Key	The *OFF* key can be used to manually stop the motor if the motor has been running on bypass power.

Operating Modes

Drive Mode	Under normal conditions the system is in the *Drive* mode. The ACH550 drive provides power to the motor and controls its speed. The source of the drive's start/stop and speed commands is determined by the *Auto* or *Hand* mode selection of the drive's keypad. Commands come from the control terminals when the *Auto* mode has been selected or from the drive keypad when the *Hand* mode has been selected. The user can normally switch to the *Drive* mode by pressing the *Drive* key on the bypass keypad.
Bypass Mode	In the *Bypass* mode, the motor is powered by AC line power through the bypass contactor. The source of the bypass start/stop commands is determined by the *Auto* or *Hand* mode selection of the bypass' keypad. Commands come from the control terminals when the *Auto* mode has been selected or from the bypass keypad when the *Hand* mode has been selected. The user can normally switch to the *Bypass* mode by

pressing the *Bypass* key on the bypass keypad. Alternative methods of bypass control called *Overrides* are also available. Refer to the following descriptions of the *Override* modes.

Fireman's Override Mode

In the *Fireman's Override (Override 1)* mode, the motor is powered by AC line power through the bypass contactor. The source of the start command is internal and unaffected by external stop commands.The user can switch to the *Fireman's Override* mode by closing the *Fireman's Override* input contact. When the *Fireman's Override* input contact is closed, the system is forced to bypass and runs the motor. The Automatic Transfer LED flashes green when the system is in override. While in *Fireman's Override* the system does not respond to any other inputs including overloads, faults, safeties and enables. *Fireman's Override* is designed for "**Run to Destruction**" operation. Normally when the *Fireman's Override* input contact is switched from closed to open, the system returns to the operating mode that existed prior to entering *Override* and can be controlled using the *Drive* and *Bypass* keys. The exception to this is when the *Bypass Override (Override 2)* input contact is closed, in which case the system switches to *Bypass Override* mode.

Bypass Override Mode

In the *Bypass Override (Override 2)* mode, the motor is powered by AC line power through the bypass contactor. The source of the start command is internal and unaffected by external stop commands.The user can switch to the *Bypass Override* mode by closing the *Bypass Override* input contact. When the *Bypass Override* input contact is closed, the system is forced to bypass and does not respond to the *Drive* and *Bypass* keys. The Automatic Transfer LED flashes green when the system is in override. While in *Bypass Override* the system responds to bypass overloads, faults, safeties and enables. Normally when the *Bypass Override* input contact is switched from closed to open, the system switches to the *Drive* mode and can be controlled using the *Drive* and *Bypass* keys.The exception to this is when the *Fireman's Override (Override 1)* input contact is closed, in which case the system remains in *Fireman's Override* mode.

Hand Mode

When the system is in the *Bypass* mode, the operator can manually start the motor by pressing the *Hand* key. The motor will run and the *Hand* LED will be illuminated green. In order to run the motor, the *Safety Interlock* and *Run Enable* contacts must be closed (green *Enable* LED) and any bypass fault must be reset.

Auto Mode

In the *Auto* mode the bypass start/stop command comes from the *Start/Stop* input terminal on the bypass control board. The *Auto* mode is selected by pressing the *Auto* key on the bypass keypad. The *Auto* LED is illuminated green when the bypass is in the *Auto* mode. If the system is in the *Bypass* mode, the motor will run across the line if the *Auto* mode is selected, the *Start/Stop, Safety Interlock* and *Run Enable* contacts are closed and any bypass fault is reset.

Off Mode

If the motor is running in the *Bypass* mode, the operator can manually stop the motor by pressing the *OFF* key. The *Hand* or *Auto* LED will go out. The motor can be restarted by pressing the *Hand* key or the bypass can be returned to the *Auto* mode by pressing the *Auto* key. If the system is in the *Drive* mode, pressing the *OFF* key will take the bypass out of the *Auto* mode, but will not affect motor operation from the drive. If the system is switched to the *Bypass* mode, a motor that is running will stop.

Bypass/Drive Mode Transfers

If the ACH550 is in the *Auto* mode and the motor is running in the *Drive* mode, the motor will transfer to bypass operation and continue running if the system is switched to the *Bypass* mode and the bypass is in the *Auto* mode with the *Start/Stop Input* contact closed.

If the motor is running in the *Bypass* mode, the motor will transfer to drive operation and continue running if the system is switched to the *Drive* mode and the drive is in the *Auto* mode with the *Start/Stop Input* contact closed.

Starting the Motor on Application of Power

If the *Safety Interlock and Run Enable Input* contacts are closed and the system is in the *Bypass* mode and in either the *Hand* or *Auto* mode, the motor will start across the line as soon as power is applied. If the system is in the *Drive* mode with the drive in the *Auto* mode, the motor will start on the drive as soon as power is applied.

Automatic Transfer Option

When the *Automatic Transfer* option is selected, the motor is automatically transferred to line power if the drive trips out on a protective trip. If automatic restart has been enabled in the drive, the drive will attempt to automatically restart before the motor is transferred to line power. The *Automatic Transfer* option is selected by setting a configuration switch on the bypass control board. See "E-Bypass Jumper, Switch and Pot Settings" on page 4-2. The *Automatic Transfer* LED is illuminated green once the system has automatically transferred to bypass operation.

Output Contactor Control

In the unlikely event of failure in the bypass control electronics, the user can engage the drive output contactor without the control electronics by using a configuration jumper on the bypass control board. See "Output Contactor Control" on page 4-5.

Bypass Control Board Inputs and Outputs

The E-Bypass control board has five relay contact (digital) inputs, six relay outputs and one digital output that are available for connection to external control circuits. The internal 24VDC supply is normally used in conjunction with the relay contact inputs. Use of an external 110 VAC power supply requires re-configuring Jumper J3. Care should be taken when using external supply voltages so as not to damage the drive and bypass electronics. The input and output functions are described below. Refer to "Chapter 3 – Installation Instructions" for additional information and connection instructions.

Relay Contact Inputs

Start/Stop — The *Start/Stop* input is connected to a normally open contact that starts and stops the system. When the E-Bypass is in the *Drive* mode and the ACH550 is in the *Auto* mode, the *Start/Stop* input contact controls the motor by starting and stopping the ACH550 drive. When the E-Bypass is in the *Bypass* mode and the *Auto* LED is illuminated green, the Start/Stop input contact controls the motor by controlling the bypass contactor.

Run Enable — The *Run Enable* input is connected to the series combination of any external normally closed permissive contacts, such as damper end switches, that must be closed to allow the motor to run. If any of these external contacts are open while a *Start* command is present, the *Enable* LED will flash and the motor is prevented from running.

Safety Interlock — The *Safety Interlock* input is connected to the series combination of any external normally closed interlock contacts, such as Firestat, Freezestat, and high static pressure switches – switches that must be closed to allow the motor to run. If any of these external contacts are open, the *Enable* LED is not illuminated, the drive output contactor, bypass contactor, and *System Started* relay are de-energized preventing the motor from running.

Fireman's Override (Override 1) — The *Fireman's Override (Override 1)* input can be connected to an external contact that is closed to select the *Fireman's Override* mode. See "Fireman's Override Mode" on page 2-8 for a description of this mode.

Bypass Override (Override 2) — The *Bypass Override (Override 2)* input can be connected to an external contact that is closed to select the *Bypass Override* mode. See "Bypass Override Mode" on page 2-8 for a description of this mode.

Relay Contact Outputs

Drive Fault — The *Drive Fault* relay is energized during normal operation. The *Drive Fault* relay is de-energized when an ACH550 drive fault has occurred.

System Run — The *System Run* relay is energized when the E-Bypass System is running. The *System Run* relay provides an output when the motor is running whether powered by the ACH550 drive or the bypass. Separate *Drive Run* and *Bypass Run* contacts can be created by using the common (C) contact of the *System Run* relay and connecting the the normally open (NO) contact of the *System Run* relay to the common (C) contact of the *Mode / Override* relay. To do this the *Mode / Override* relay must be configured for *Mode* relay operation. See "E-Bypass Jumper, Switch and Pot Settings" on page 4-2. The normally closed (NC) contact of the *Mode* relay becomes the *Drive Run* contact and the normally open (NO) contact of the *Mode* relay becomes the *Bypass Run* contact This configuration provides outputs that are closed when the motor is running. See "Typical Applications and Configurations" at the end of this Chapter.

System Started

The *System Started* relay is energized when the E-Bypass system is started. Three conditions must be met in order for the relay to energize.
1) a *Start* command must be present,
2) the *Safety Interlock* input contact must be closed and
3) there can be no fault present in the system.

The *Start* command can come from the bypass control board terminal block, the ACH550 keypad, the bypass keypad, or serial communications depending on the operational mode selected. The *System Started* relay is ideal for use in damper actuator circuits, opening the dampers only under those conditions where the system is preparing to run the motor. Closing the dampers if the safeties open, the system faults, or when a *Stop* command is issued.

Mode/Override

The *Mode* / *Override* relay is a configurable relay. The function of the relay is selectable between *Mode* and *Override* operation. If the *Mode* / *Override* relay is configured for *Mode* operation (Default), the relay is energized when the *Bypass* mode is selected and de-energized when the *Drive* mode is selected. If the *Mode* / *Override* relay is configured for *Override* operation, the relay is energized when the *Override* mode is selected and de-energized in all other modes. See "E-Bypass Jumper, Switch and Pot Settings" on page 4-2.

Bypass Fault

The *Bypass Fault* relay is energized during normal operation. The *Bypass Fault* relay is de-energized when a bypass fault has occurred or when the bypass motor overload/underload protection has tripped.

Hand/Off/Auto

The *Hand/Off/Auto* relay is energized when the bypass is in the *Auto* mode and de-energized in the *Hand* mode and when the bypass is *Off*. In the Auto mode the bypass start/stop command comes from the *Start/Stop* input terminal on the bypass control board.

Digital Output

Safety Interlock

The *Safety Interlock* output is active when the *Safety Interlock Input* contact is closed. The *Safety Interlock* output is available for customer connection and routing through the ACH550 drive. User's can select from a variety of optional communication protocols to monitor the *Safety Interlock* status through the ACH550 digital inputs. Refer to the *ACH550-UH User's Manual* and the appropriate communications manual for additional information about monitoring ACH550 digital inputs.

ACH550 Drive Inputs and Outputs

Some of the ACH550 inputs and outputs are pre-wired to the bypass control board and not available for external use. The inputs and outputs that are not pre-wired are available for external use by connecting directly to the terminals in the ACH550. The pre-wired and available inputs and outputs are described below. Refer to the *ACH550-UH User's Manual* for additional information about the inputs and outputs. See also "Chapter 3 – Installation Instructions" for additional information and connection instructions.

The ACH550 has two relay outputs that are pre-wired to the bypass control board. These two relay outputs are used to provide the *System (Drive) Started* and *Drive Fault* outputs that are described above.

Two of the ACH550's digital inputs, the *Auto Mode Start/Stop* input and the *Run Enable* input are also pre-wired to the bypass control board. These two digital inputs are coordinated with the *Start/Stop* and *Run Enable* inputs that control the motor in both the Drive and Bypass modes of operation.

Caution: The E-Bypass will not work properly if the Drive relay outputs RO1 and RO3 or the Drive digital inputs DI1 and DI2 are reassigned by changing ACH550 configuration settings. The only macro that, by default, provides the proper configuration settings is the E-Bypass macro. If any other macro will be used, see "Macros and Parameter Settings" on page 4-6.

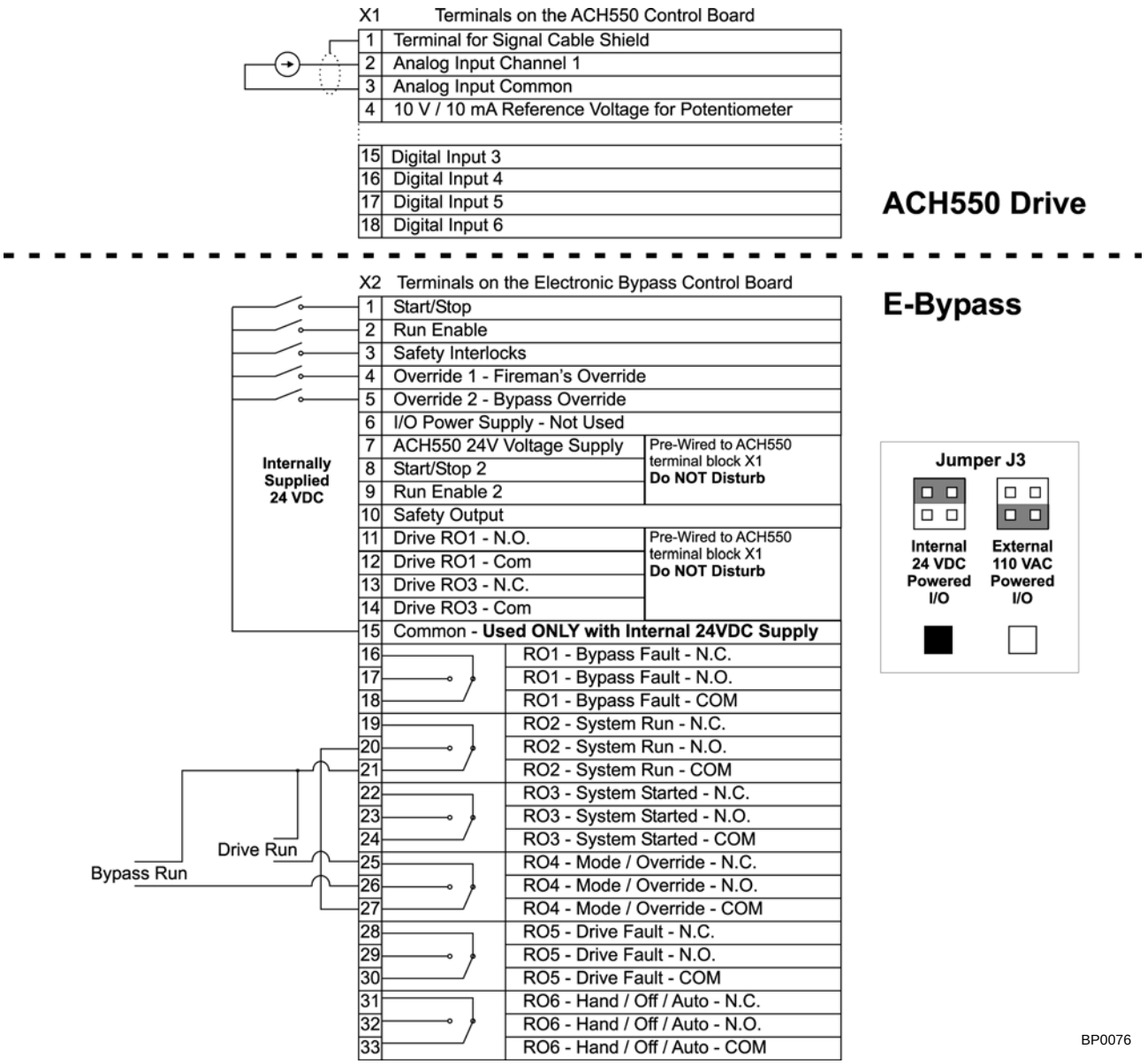
Four of the digital inputs of the ACH550 are available for routing E-Bypass outputs (digital and relay) through the ACH550 drive. Users can select from a variety of communication protocols to monitor the E-Bypass status through the ACH550 digital inputs. The digital inputs of the ACH550 are also available for selecting constant speeds or providing *Speed Increase* and *Speed Decrease* inputs. The functions of these inputs is determined by the ACH550 macro selection. Refer to the *ACH550-UH User's Manual* for additional information.

The ACH550 *Auto Mode External Reference* input is an analog input that sets the operating speed when the ACH550 *HVAC* macro is selected and the drive is in the *Auto* mode. When the HVAC PID Control macro is selected, analog inputs are used for setting the PID reference and receiving the transducer feedback "actual" signal. Refer to the *ACH550-UH User's Manual* for additional information.

The *Output Frequency* analog output of the ACH550 provides a 4 to 20 mA signal proportional to the drive output frequency or motor speed.

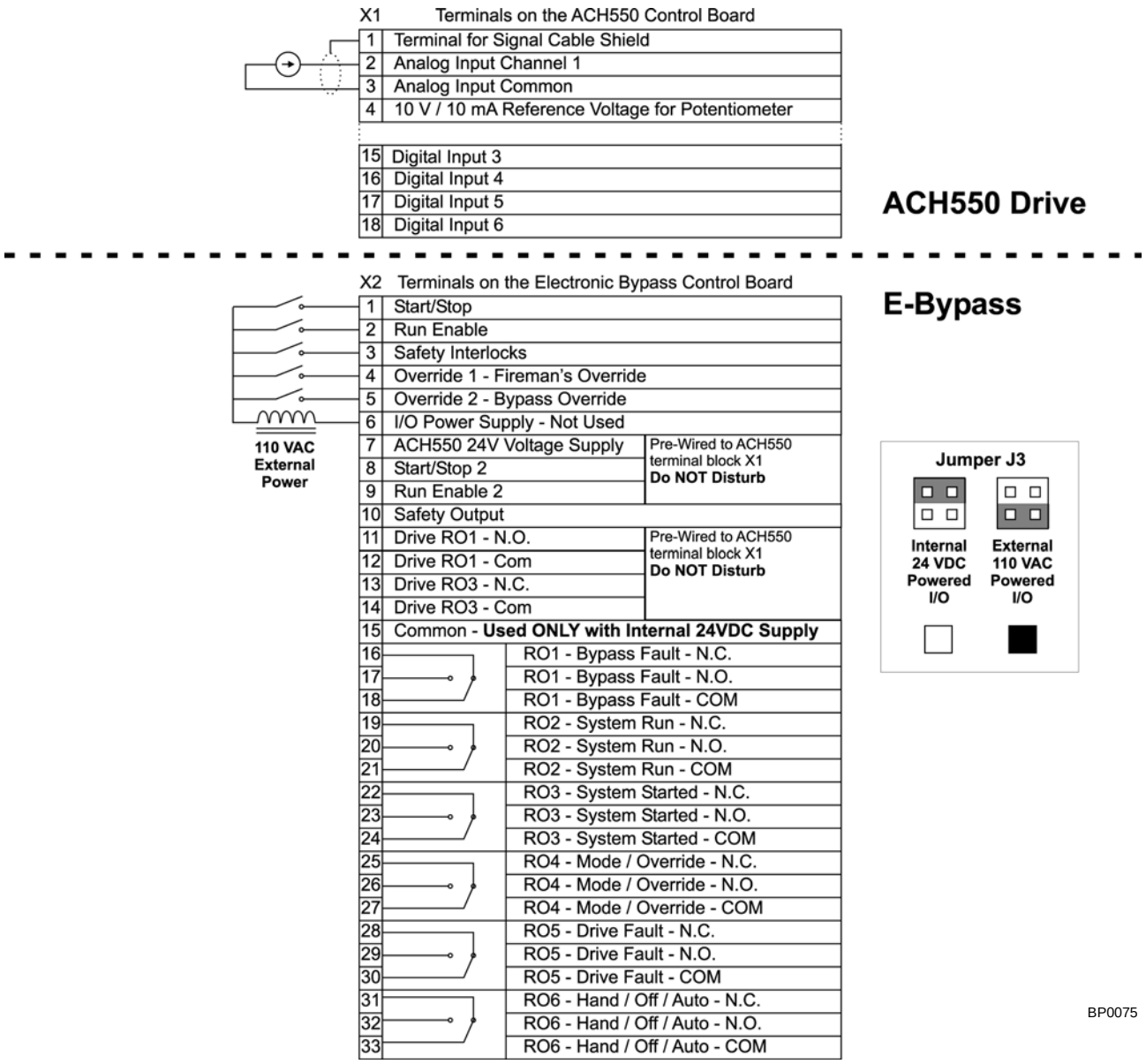
Typical Applications and Configurations

The following figures show the connections for several typical applications.


X1 Terminals on the ACH550 Control Board
1 Terminal for Signal Cable Shield
2 Analog Input Channel 1
3 Analog Input Common
4 10 V / 10 mA Reference Voltage for Potentiometer
15 Digital Input 3
16 Digital Input 4
17 Digital Input 5
18 Digital Input 6
ACH550 Drive
X2 Terminals on the Electronic Bypass Control Board
E-Bypass
1 Start/Stop
2 Run Enable
3 Safety Interlocks
4 Override 1 - Fireman's Override
5 Override 2 - Bypass Override
6 I/O Power Supply - Not Used
7 ACH550 24V Voltage Supply
8 Start/Stop 2
9 Run Enable 2
Pre-Wired to ACH550 terminal block X1 Do NOT Disturb
Internally Supplied 24 VDC
10 Safety Output
11 Drive RO1 - N.O.
12 Drive RO1 - Com
13 Drive RO3 - N.C.
14 Drive RO3 - Com
Pre-Wired to ACH550 terminal block X1 Do NOT Disturb
15 Common - Used ONLY with Internal 24VDC Supply
16 RO1 - Bypass Fault - N.C.
17 RO1 - Bypass Fault - N.O.
18 RO1 - Bypass Fault - COM
19 RO2 - System Run - N.C.
20 RO2 - System Run - N.O.
21 RO2 - System Run - COM
22 RO3 - System Started - N.C.
23 RO3 - System Started - N.O.
24 RO3 - System Started - COM
25 RO4 - Mode / Override - N.C.
26 RO4 - Mode / Override - N.O.
27 RO4 - Mode / Override - COM
28 RO5 - Drive Fault - N.C.
29 RO5 - Drive Fault - N.O.
30 RO5 - Drive Fault - COM
31 RO6 - Hand / Off / Auto - N.C.
32 RO6 - Hand / Off / Auto - N.O.
33 RO6 - Hand / Off / Auto - COM
Drive Run
Bypass Run
Jumper J3
Internal 24 VDC Powered I/O
External 110 VAC Powered I/O
BP0076

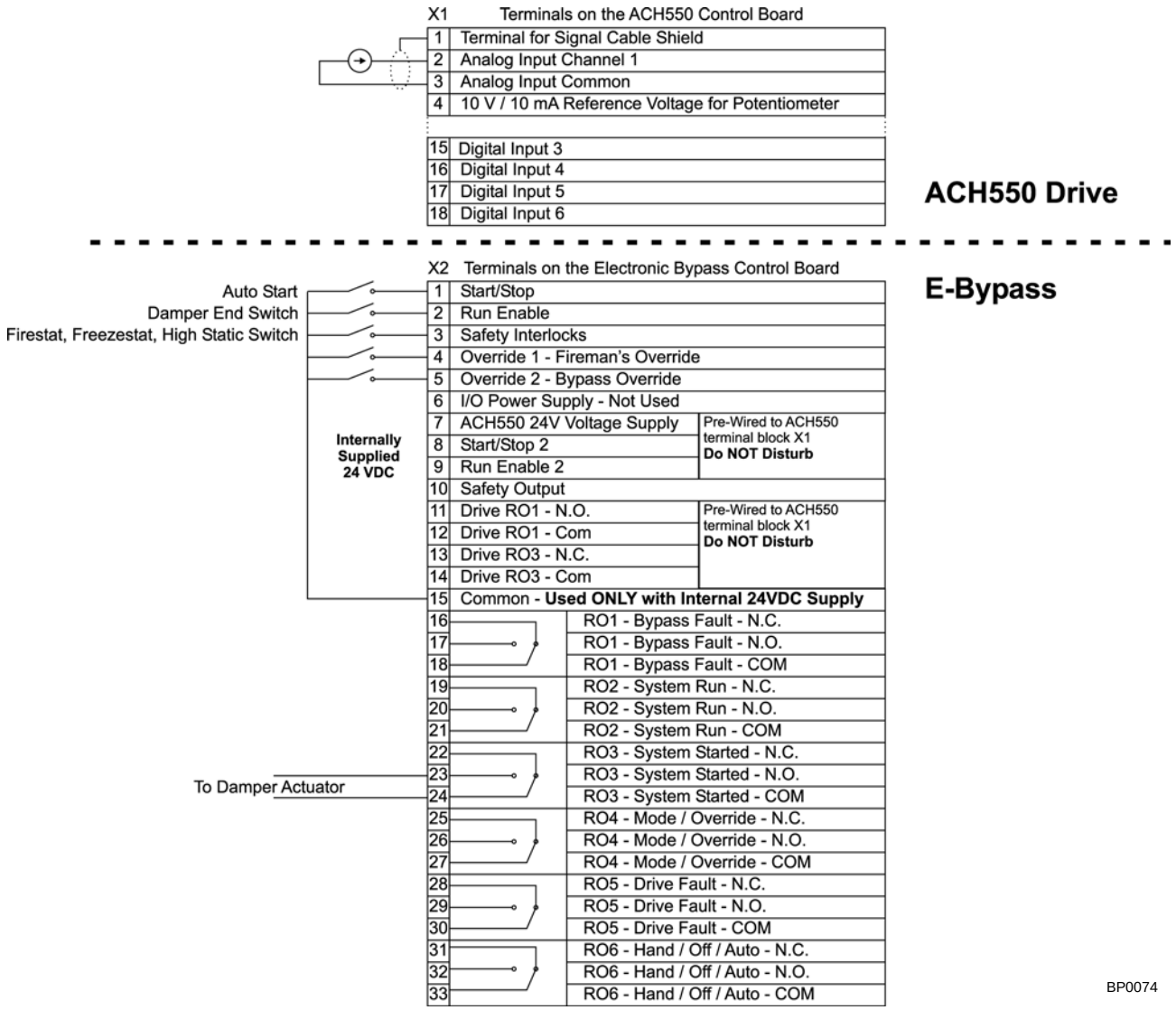
Parameter Number	Description	Setting
1001	EXTERNAL 1 COMMANDS	1 (DI1)
1002	EXTERNAL 2 COMMANDS	1 (DI1)
1601	RUN ENABLE	2 (DI2)
1401	RELAY OUTPUT 1	7 (STARTED)
1403	RELAY OUTPUT 3	3 (FAULT (-1))

Figure 2-5 Basic Control Connections for Separate Drive Run & Bypass Run Commands


X1 Terminals on the ACH550 Control Board
1 Terminal for Signal Cable Shield
2 Analog Input Channel 1
3 Analog Input Common
4 10 V / 10 mA Reference Voltage for Potentiometer
15 Digital Input 3
16 Digital Input 4
17 Digital Input 5
18 Digital Input 6
ACH550 Drive
X2 Terminals on the Electronic Bypass Control Board
E-Bypass
1 Start/Stop
2 Run Enable
3 Safety Interlocks
4 Override 1 - Fireman's Override
5 Override 2 - Bypass Override
6 I/O Power Supply - Not Used
7 ACH550 24V Voltage Supply
8 Start/Stop 2
9 Run Enable 2
Pre-Wired to ACH550 terminal block X1 Do NOT Disturb
10 Safety Output
11 Drive RO1 - N.O.
12 Drive RO1 - Com
13 Drive RO3 - N.C.
14 Drive RO3 - Com
Pre-Wired to ACH550 terminal block X1 Do NOT Disturb
15 Common - Used ONLY with Internal 24VDC Supply
16 RO1 - Bypass Fault - N.C.
17 RO1 - Bypass Fault - N.O.
18 RO1 - Bypass Fault - COM
19 RO2 - System Run - N.C.
20 RO2 - System Run - N.O.
21 RO2 - System Run - COM
22 RO3 - System Started - N.C.
23 RO3 - System Started - N.O.
24 RO3 - System Started - COM
25 RO4 - Mode / Override - N.C.
26 RO4 - Mode / Override - N.O.
27 RO4 - Mode / Override - COM
28 RO5 - Drive Fault - N.C.
29 RO5 - Drive Fault - N.O.
30 RO5 - Drive Fault - COM
31 RO6 - Hand / Off / Auto - N.C.
32 RO6 - Hand / Off / Auto - N.O.
33 RO6 - Hand / Off / Auto - COM
110 VAC External Power
Jumper J3
Internal 24 VDC Powered I/O
External 110 VAC Powered I/O
BP0075

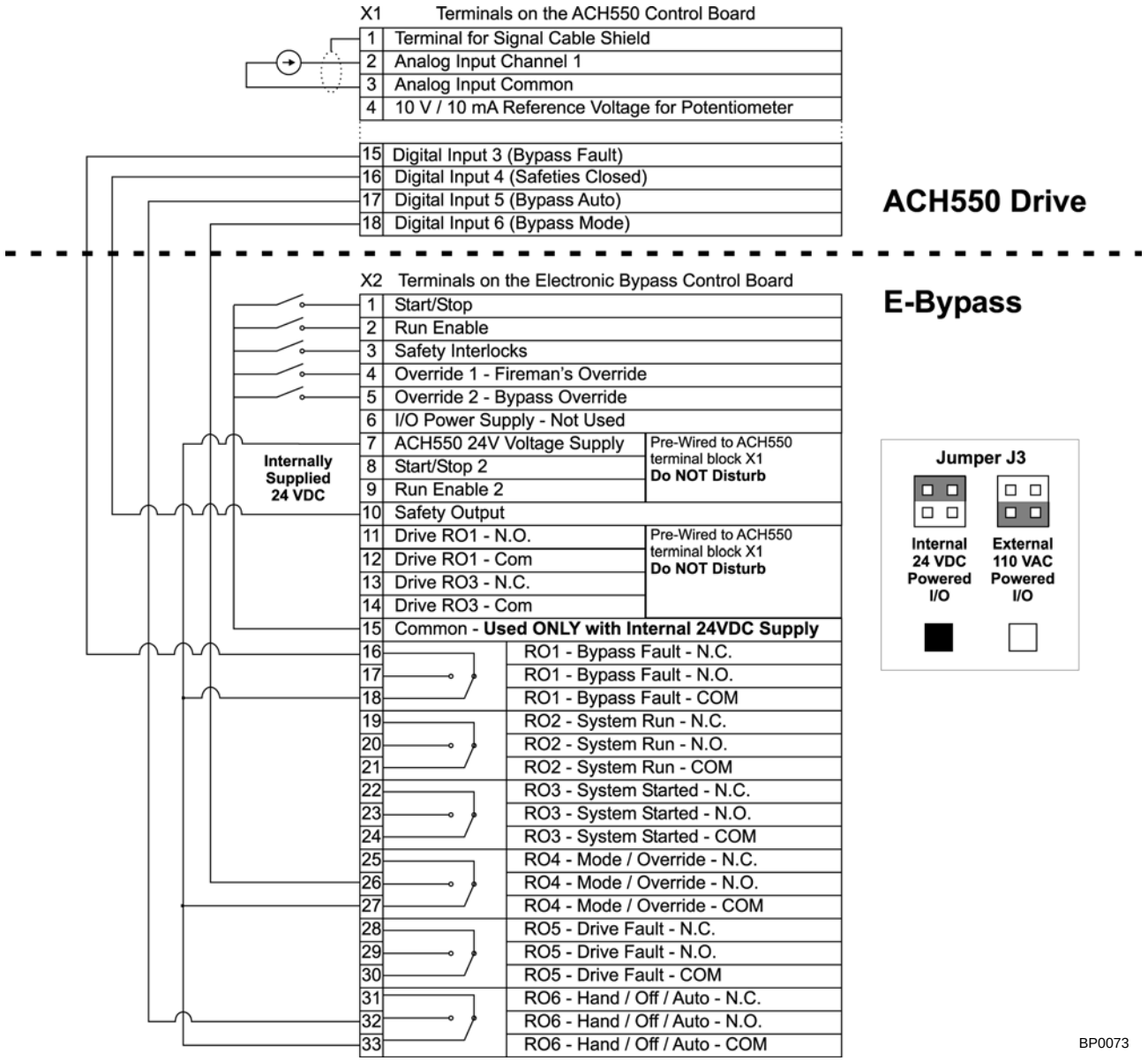
Parameter Number	Description	Setting
1001	EXTERNAL 1 COMMANDS	1 (DI1)
1002	EXTERNAL 2 COMMANDS	1 (DI1)
1601	RUN ENABLE	2 (DI2)
1401	RELAY OUTPUT 1	7 (STARTED)
1403	RELAY OUTPUT 3	3 (FAULT (-1))

Figure 2-6 Basic Control Connections for Externally Supplied 115 VAC Power


X1 Terminals on the ACH550 Control Board
1 Terminal for Signal Cable Shield
2 Analog Input Channel 1
3 Analog Input Common
4 10 V / 10 mA Reference Voltage for Potentiometer
15 Digital Input 3
16 Digital Input 4
17 Digital Input 5
18 Digital Input 6
ACH550 Drive
E-Bypass
X2 Terminals on the Electronic Bypass Control Board
Auto Start
Damper End Switch
Firestat, Freezestat, High Static Switch
Internally Supplied 24 VDC
1 Start/Stop
2 Run Enable
3 Safety Interlocks
4 Override 1 - Fireman's Override
5 Override 2 - Bypass Override
6 I/O Power Supply - Not Used
7 ACH550 24V Voltage Supply
8 Start/Stop 2
9 Run Enable 2
Pre-Wired to ACH550 terminal block X1 Do NOT Disturb
10 Safety Output
11 Drive RO1 - N.O.
12 Drive RO1 - Com
13 Drive RO3 - N.C.
14 Drive RO3 - Com
Pre-Wired to ACH550 terminal block X1 Do NOT Disturb
15 Common - Used ONLY with Internal 24VDC Supply
16 RO1 - Bypass Fault - N.C.
17 RO1 - Bypass Fault - N.O.
18 RO1 - Bypass Fault - COM
19 RO2 - System Run - N.C.
20 RO2 - System Run - N.O.
21 RO2 - System Run - COM
22 RO3 - System Started - N.C.
23 RO3 - System Started - N.O.
24 RO3 - System Started - COM
To Damper Actuator
25 RO4 - Mode / Override - N.C.
26 RO4 - Mode / Override - N.O.
27 RO4 - Mode / Override - COM
28 RO5 - Drive Fault - N.C.
29 RO5 - Drive Fault - N.O.
30 RO5 - Drive Fault - COM
31 RO6 - Hand / Off / Auto - N.C.
32 RO6 - Hand / Off / Auto - N.O.
33 RO6 - Hand / Off / Auto - COM
BP0074

Parameter Number	Description	Setting
1001	EXTERNAL 1 COMMANDS	1 (DI1)
1002	EXTERNAL 2 COMMANDS	1 (DI1)
1601	RUN ENABLE	2 (DI2)
1401	RELAY OUTPUT 1	7 (STARTED)
1403	RELAY OUTPUT 3	3 (FAULT (-1))

Figure 2-7 Basic Control Connections for Damper Actuator Control


X1 Terminals on the ACH550 Control Board
1 Terminal for Signal Cable Shield
2 Analog Input Channel 1
3 Analog Input Common
4 10 V / 10 mA Reference Voltage for Potentiometer
15 Digital Input 3 (Bypass Fault)
16 Digital Input 4 (Safeties Closed)
17 Digital Input 5 (Bypass Auto)
18 Digital Input 6 (Bypass Mode)
ACH550 Drive
E-Bypass
X2 Terminals on the Electronic Bypass Control Board
1 Start/Stop
2 Run Enable
3 Safety Interlocks
4 Override 1 - Fireman's Override
5 Override 2 - Bypass Override
6 I/O Power Supply - Not Used
7 ACH550 24V Voltage Supply
8 Start/Stop 2
9 Run Enable 2
Pre-Wired to ACH550 terminal block X1 Do NOT Disturb
Internally Supplied 24 VDC
10 Safety Output
11 Drive RO1 - N.O.
12 Drive RO1 - Com
13 Drive RO3 - N.C.
14 Drive RO3 - Com
Pre-Wired to ACH550 terminal block X1 Do NOT Disturb
15 Common - Used ONLY with Internal 24VDC Supply
16 RO1 - Bypass Fault - N.C.
17 RO1 - Bypass Fault - N.O.
18 RO1 - Bypass Fault - COM
19 RO2 - System Run - N.C.
20 RO2 - System Run - N.O.
21 RO2 - System Run - COM
22 RO3 - System Started - N.C.
23 RO3 - System Started - N.O.
24 RO3 - System Started - COM
25 RO4 - Mode / Override - N.C.
26 RO4 - Mode / Override - N.O.
27 RO4 - Mode / Override - COM
28 RO5 - Drive Fault - N.C.
29 RO5 - Drive Fault - N.O.
30 RO5 - Drive Fault - COM
31 RO6 - Hand / Off / Auto - N.C.
32 RO6 - Hand / Off / Auto - N.O.
33 RO6 - Hand / Off / Auto - COM
Jumper J3
Internal 24 VDC Powered I/O
External 110 VAC Powered I/O
BP0073

Parameter Number	Description	Setting
1001	EXTERNAL 1 COMMANDS	1 (DI1)
1002	EXTERNAL 2 COMMANDS	1 (DI1)
1201	CONST SPEED SEL	0 (NOT SEL)
1601	RUN ENABLE	2 (DI2)
1401	RELAY OUTPUT 1	7 (STARTED)
1403	RELAY OUTPUT 3	3 (FAULT (-1))

Figure 2-8 Basic Control Connections for Routing Outputs Through the ACH550

X1 Terminals on the ACH550 Control Board

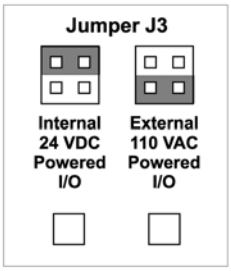
1	Terminal for Signal Cable Shield
2	Analog Input Channel 1
3	Analog Input Common
4	10 V / 10 mA Reference Voltage for Potentiometer
15	Digital Input 3
16	Digital Input 4
17	Digital Input 5
18	Digital Input 6

ACH550 Drive

X2 Terminals on the Electronic Bypass Control Board

1	Start/Stop	
2	Run Enable	
3	Safety Interlocks	
4	Override 1 - Fireman's Override	
5	Override 2 - Bypass Override	
6	I/O Power Supply - Not Used	
7	ACH550 24V Voltage Supply	Pre-Wired to ACH550 terminal block X1 **Do NOT Disturb**
8	Start/Stop 2	
9	Run Enable 2	
10	Safety Output	
11	Drive RO1 - N.O.	Pre-Wired to ACH550 terminal block X1 **Do NOT Disturb**
12	Drive RO1 - Com	
13	Drive RO3 - N.C.	
14	Drive RO3 - Com	
15	Common - **Used ONLY with Internal 24VDC Supply**	
16	RO1 - Bypass Fault - N.C.	
17	RO1 - Bypass Fault - N.O.	
18	RO1 - Bypass Fault - COM	
19	RO2 - System Run - N.C.	
20	RO2 - System Run - N.O.	
21	RO2 - System Run - COM	
22	RO3 - System Started - N.C.	
23	RO3 - System Started - N.O.	
24	RO3 - System Started - COM	
25	RO4 - Mode / Override - N.C.	
26	RO4 - Mode / Override - N.O.	
27	RO4 - Mode / Override - COM	
28	RO5 - Drive Fault - N.C.	
29	RO5 - Drive Fault - N.O.	
30	RO5 - Drive Fault - COM	
31	RO6 - Hand / Off / Auto - N.C.	
32	RO6 - Hand / Off / Auto - N.O.	
33	RO6 - Hand / Off / Auto - COM	

E-Bypass



BP0072

Parameter Number	Description	Setting
1001	EXTERNAL 1 COMMANDS	1 (DI1)
1002	EXTERNAL 2 COMMANDS	1 (DI1)
1601	RUN ENABLE	2 (DI2)
1401	RELAY OUTPUT 1	7 (STARTED)
1403	RELAY OUTPUT 3	3 (FAULT (-1))

Figure 2-9 Customer Control Connection Worksheet

Chapter 3 – Installation Instructions

This chapter explains how to install the ACH550 with E-Bypass and connect all power, motor, and control wiring. It also explains the initial inspection procedures.

Pre-Installation Planning

Before beginning installation, review the installation instructions in this chapter and make sure that the installation requirements can be met. The following topics should be considered in pre-installation planning:

- Environment
- Heat Dissipation Requirements
- Mounting Area
- Wiring Requirements

Environment

The ACH550 with E-Bypass must be installed in a heated, indoor controlled environment that is relatively free of moisture and conductive contaminants such as condensation, carbon dust, and the like.

The maximum ambient temperature allowed is 104°F (40°C) for an ACH550 in the E-Bypass enclosure. The rating is based on a variable torque load with the load current lower than or equal to the continuous maximum load current.

Heat Dissipation Requirements

ACH550 drives are self-cooled. The cooling air entering the drive must be clean and free from corrosive materials. The tables below give the heat dissipated into the hot air exhausted from the drives. If the drives are installed in a confined space, the heat must be removed from the area by ventilation or air conditioning equipment.

Table 3-1 208 - 240 Volt, Heat Dissipation for ACH550 E-Bypass Units

208 - 240 Volt		Heat Dissipation and Airflow Requirements		
HP	**Identification**	**Watts**	**BTU/Hr**	**CFM**
1	ACH550ACH550-xx-04A6-2	55	189	26
1.5	ACH550ACH550-xx-06A6-2	73	249	26
2	ACH550ACH550-xx-07A5-2	81	176	26
3	ACH550ACH550-xx-012A-2	116	404	26
5	ACH550ACH550-xx-017A-2	161	551	26
7.5	ACH550ACH550-xx-024A-2	227	776	52
10	ACH550ACH550-xx-031A-2	285	373	52
15	ACH550ACH550-xx-046A-2	420	1434	79
20	ACH550ACH550-xx-059A-2	536	1829	79
25	ACH550ACH550-xx-075A-2	671	2290	165
30	ACH550ACH550-xx-088A-2	786	2685	165
40	ACH550ACH550-xx-114A-2	1014	3463	165
50	ACH550ACH550-xx-143A-2	1268	4431	238
60	ACH550ACH550-xx-178A-2	1575	5379	238
75	ACH550ACH550-xx-221A-2	1952	6666	238
100	ACH550ACH550-xx-248A-2	2189	7474	238

Table 3-2 380 - 480 Volt, Heat Dissipation for ACH550 E-Bypass Units

380 - 480 Volt		Heat Dissipation and Airflow Requirements		
HP	**Identification**	**Watts**	**BTU/Hr**	**CFM**
1/1.5	ACH550ACH550-xx-03A3-4	40	137	26
2	ACH550ACH550-xx-04A1-4	52	177	26
3	ACH550ACH550-xx-06A9-4	97	331	26
5	ACH550ACH550-xx-08A8-4	127	433	26
7.5	ACH550ACH550-xx-012A-4	172	587	26
10	ACH550ACH550-xx-015A-4	232	792	52
15	ACH550ACH550-xx-023A-4	337	1150	52
20	ACH550ACH550-xx-031A-4	457	1560	79
25	ACH550ACH550-xx-038A-4	562	1918	79
30	ACH550ACH550-xx-044A-4	667	2276	165
40	ACH550ACH550-xx-059A-4	907	3096	165
50	ACH550ACH550-xx-072A-4	1120	3820	165
60	ACH550ACH550-xx-077A-4	1295	4420	99
75	ACH550ACH550-xx-096A-4	1440	4915	99
100	ACH550ACH550-xx-124A-4	1940	6621	238
125	ACH550ACH550-xx-157A-4	2310	7884	238
150	ACH550ACH550-xx-180A-4	2810	9590	238
200	ACH550ACH550-xx-245A-4	3850	13000	300
250	ACH550ACH550-xx-316A-4	5300	18000	700
300	ACH550ACH550-xx-368A-4	6850	23000	700
350	ACH550ACH550-xx-414A-4	7000	24000	700
400	ACH550ACH550-xx-486A-4	7600	26000	700

If the cooling air contains dust, clean the cooling surfaces of the unit regularly using compressed air and a brush. If the ACH550 is in a UL type 1 enclosure, cover the vents during cleaning to prevent the dust from entering the unit.

If the heatsink is not cleaned and is not able to dissipate the expended heat, the ACH550's thermal protection will activate, causing a fault indication which stops the drive. The ACH550 can be started again when the temperature of the heatsink has fallen below the trip level.

Mounting Location

When mounting the unit take the following precautions:

- DO NOT mount in direct sunlight.
- DO NOT mount on surfaces with temperatures above 104°F (40°C).
- DO NOT allow the ambient temperature around the ACH550 to exceed the ambient temperature as stated in *Environment* above.
- Mount the E-Bypass enclosure vertically with the ACH550 control panel and Bypass control panel visible and the disconnect accessible.
- Enclosure dimension drawings are presented in this chapter.
- For proper cooling, each unit must have two inches (50 mm) of clear space on each side. If units are to be mounted next to each other, there must be a total of four inches (100 mm) from unit to unit.
- The units cannot be mounted one above the other.

Wiring Requirements

The ACH550 with E-Bypass is designed for use on a three-phase system. Four wires (three phase wires plus a ground wire) are required for the input wiring. Input and output conductors, and branch circuit protection must be sized to local codes. All field power wiring shall be copper, rated for 60°C if rated for less than 100 amps or 75°C if rated 100 amps or more. At least three separate metallic conduits are required, one for input power, one for output power to the motor and one for control signals. The External Speed Reference signal must be wired using a shielded twisted pair cable. Refer to "Electrical Installation" on page 3-11 for detailed wiring information.

Initial Inspection Procedure

As you unpack the ACH550 with E-Bypass, check for any signs of damage and verify that the delivery is complete by examining the contents for items such as the user’s manual, keypad, etc. In the event of damage, please contact the shipping company or the supplier. Locate the drive nameplate and confirm that the E-Bypass is configured to the order specifications. Refer to "Chapter 2 – Overview of ACH550 with E-Bypass" in this manual.

If the E-Bypass is stored before start-up, verify that the environmental conditions in the storage room meet the following conditions:

- Temperature between -40°F and +158°F (-40°C and +70°C).
- Relative humidity less than 95 percent.
- No condensation.

The warranty covers defects in manufacturing. The manufacturer carries no responsibility for damage incurred during transport or unpacking.

If any questions arise concerning the ACH550 with E-Bypass, please contact your Distributor or local ABB Drives Office.

Mechanical Installation

Securely mount the ACH550 with E-Bypass on a wall in a vertical position. Use the four mounting notches at the top and bottom of the unit. Before mounting the unit, verify that the environmental conditions conform to the specifications listed in "Pre-Installation Planning" in this chapter.

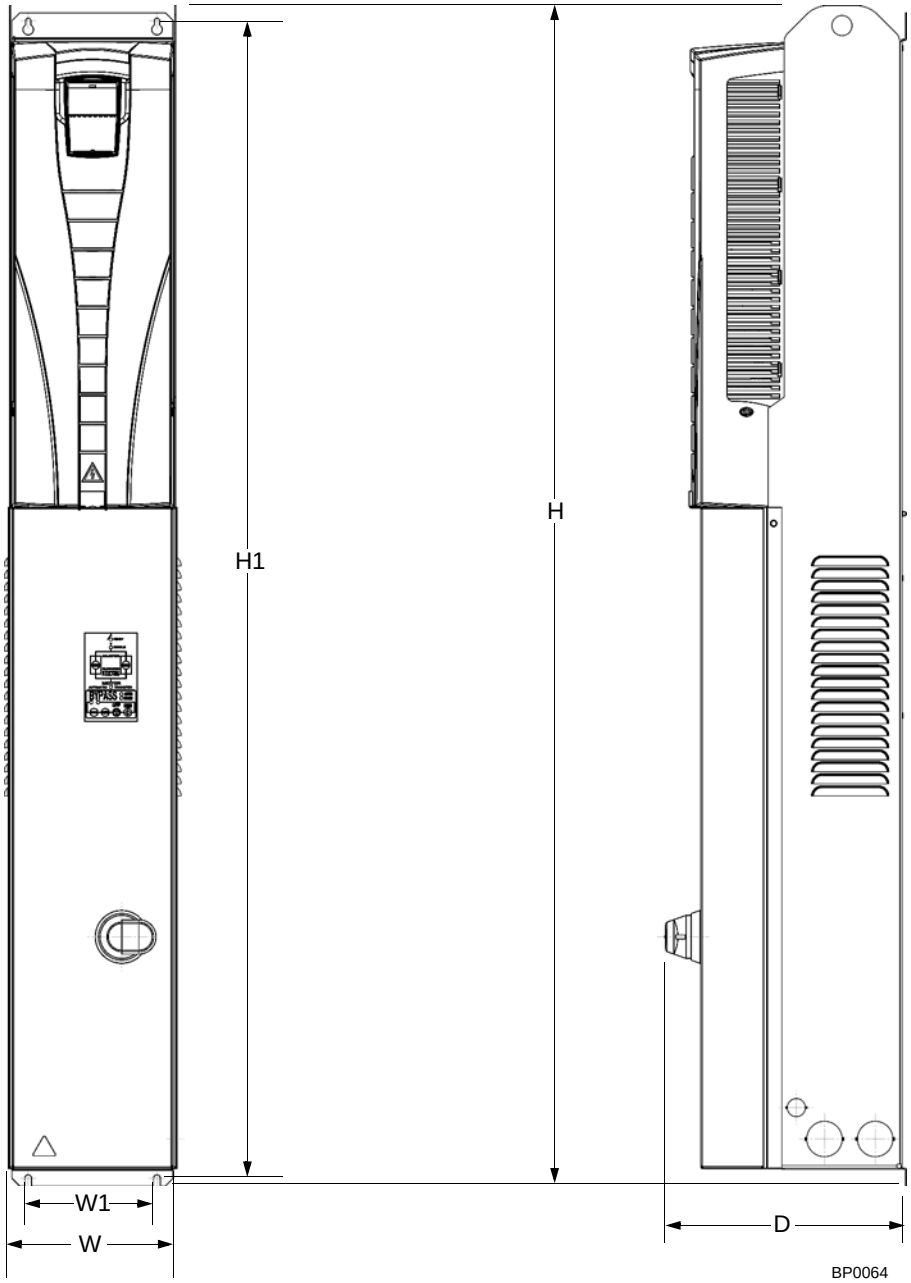
To ensure safe installation, check that the surface of the mounting location is flat.

Attach the E-Bypass enclosure at the mounting notches and tighten the bolts.

Dimensions and Weights

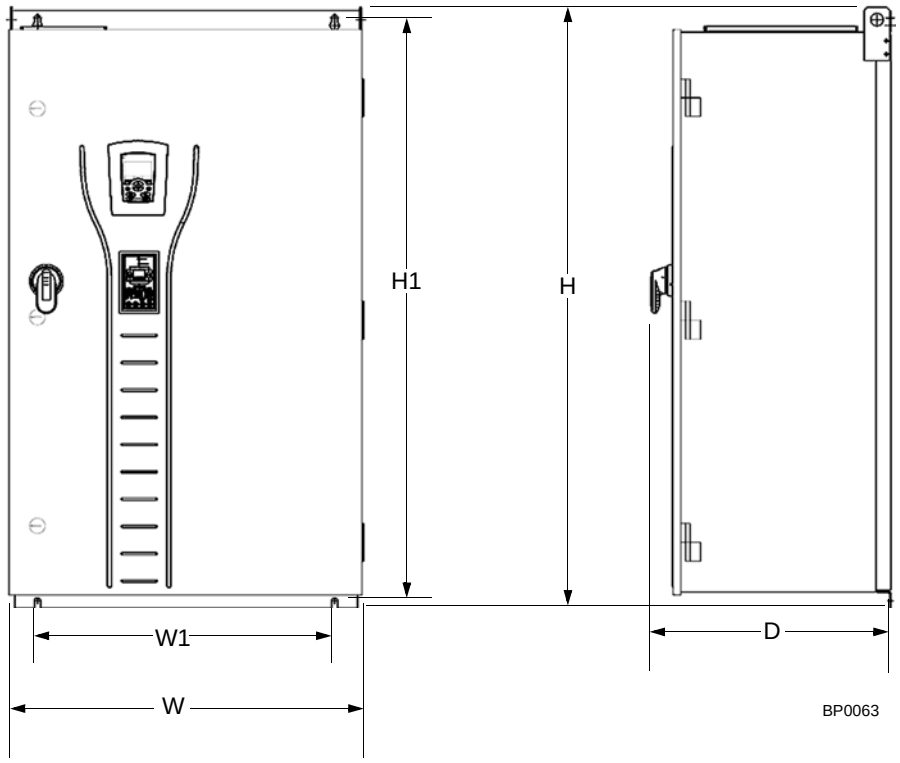
The dimensions and weights of the ACH550 E-Bypass units are given in the following illustrations.

Vertical E-Bypass
UL type 1, R1…R4



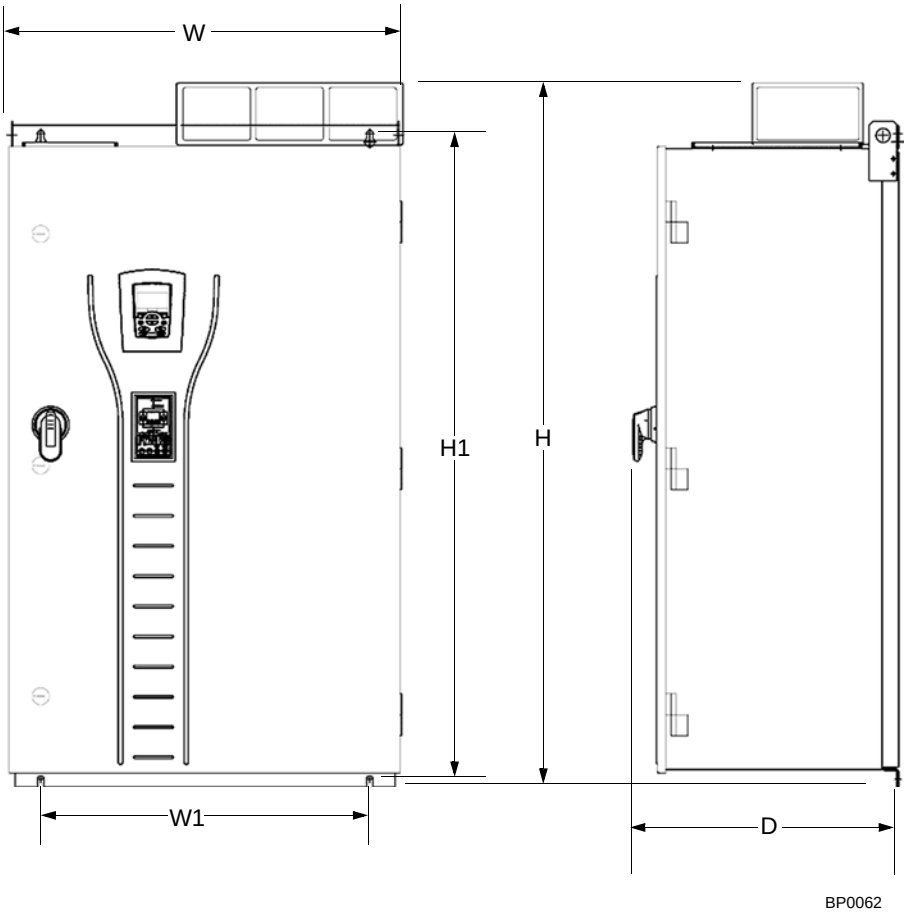
Vertical E-Bypass, UL type 1								
Dimensions Ref.	**R1**		**R2**		**R3**		**R4**	
	mm	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**
W	136	5.4	136	5.4	220	8.7	220	8.7
W1	98	3.9	98	3.9	160	6.3	160	6.3
H	1095	43.1	1195	47	1361	53.6	1466	57.7
H1	1078	42.4	1178	46.4	1332	52.4	1437	56.6
D	219	8.6	230	9	269	10.6	269	10.6
	kg	**lb.**	**kg**	**lb.**	**kg**	**lb.**	**kg**	**lb.**
Mass	18	40	23	50	50.8	112	59.4	131

Standard E-Bypass
UL type 1, R1…R6



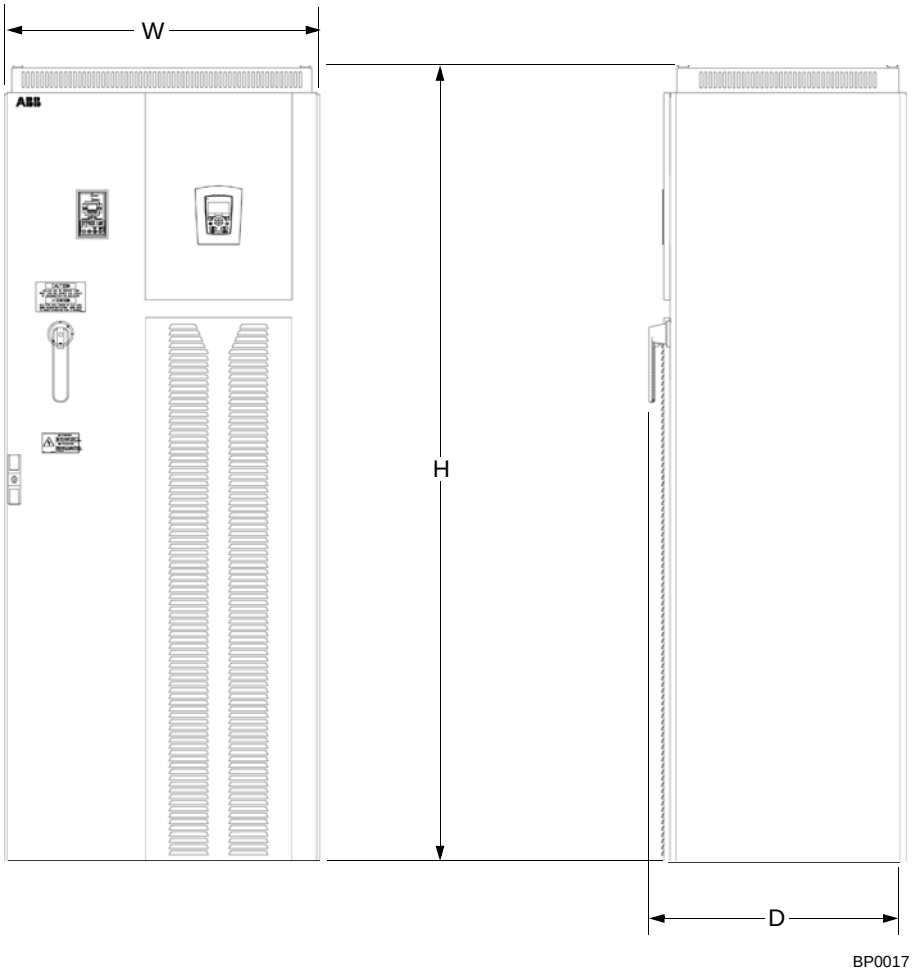
Standard E-Bypass, UL type 1, R1…R6												
Dimensions Ref.	**R1**		**R2**		**R3**		**R4**		**R5**		**R6**	
	mm	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**
W	443	17.4	443	17.4	521	20.5	521	20.5	713	28.1	713	28.1
W1	320	12.6	320	12.6	400	15.7	400	15.7	713	28.1	713	28.1
H	849	33.4	849	33.4	957	37.7	957	37.7	1212	47.7	1212	47.7
H1	810	31.9	810	31.9	920	36.2	920	36.2	1175	46.3	1175	46.3
D	319	12.6	319	12.6	365	14.4	365	14.4	485	19.1	485	19.1
	kg	**lb.**	**kg**	**lb.**	**kg**	**lb.**	**kg**	**lb.**	**kg**	**lb.**	**kg**	**lb.**
Mass	35.4	78	38.1	84	54.4	120	62.6	138	120.6	266	163.3	360

Standard E-Bypass
UL type 12, R1…R6



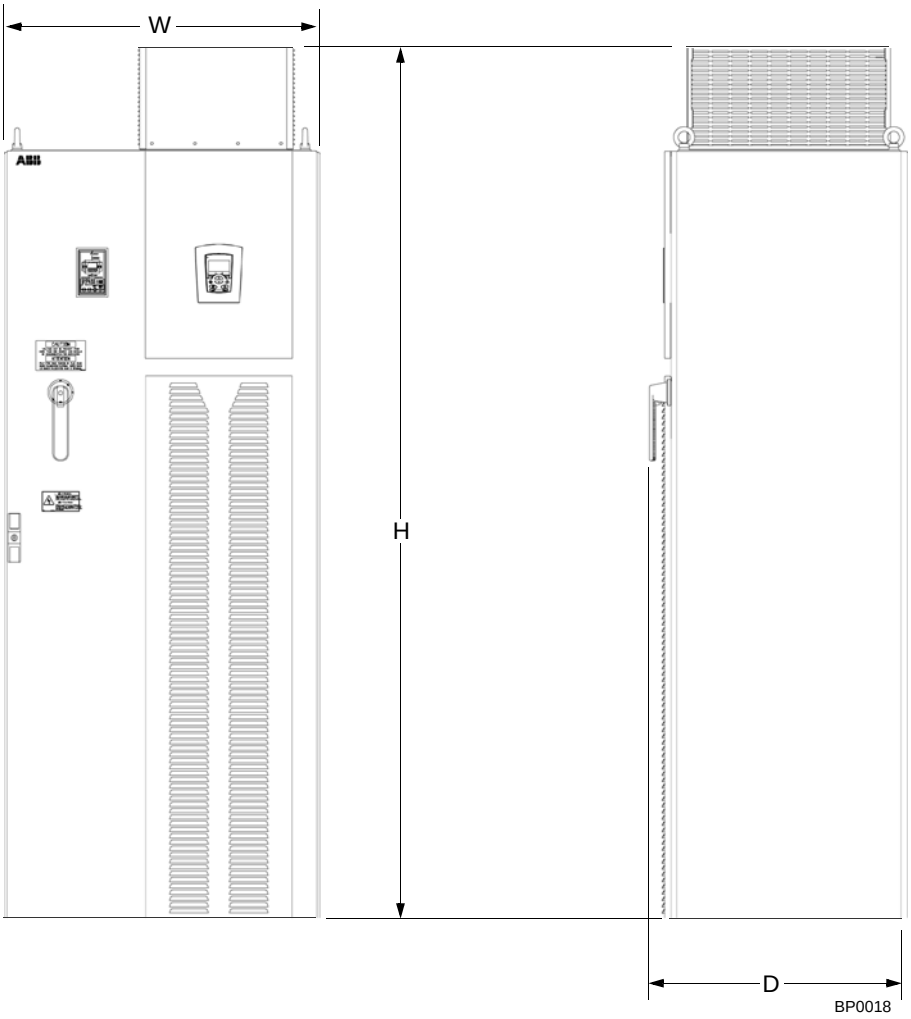
Standard E-Bypass, UL type 12, R1…R6												
Dimensions Ref.	**R1**		**R2**		**R3**		**R4**		**R5**		**R6**	
	mm	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**	**mm**	**in.**
W	443	17.4	443	17.4	521	20.5	521	20.5	713	28.1	713	28.1
W1	320	12.6	320	12.6	400	15.7	400	15.7	713	28.1	713	28.1
H	862	33.9	862	33.9	995	39.2	995	39.2	1282	50.5	1282	50.5
H1	810	31.9	810	31.9	920	36.2	920	36.2	1175	46.3	1175	46.3
D	319	12.6	319	12.6	365	14.4	365	14.4	485	19.1	485	19.1
	kg	**lb.**	**kg**	**lb.**	**kg**	**lb.**	**kg**	**lb.**	**kg**	**lb.**	**kg**	**lb.**
Mass	35.4	78	38.1	84	55.8	123	63.9	141	122.9	271	165.6	365

Standard E-Bypass
UL type 1, R7…R8



Standard E-Bypass, UL type 1, R7…R8				
Dimensions Ref.	**R7**		**R8**	
	mm	**in.**	**mm**	**in.**
W	806	31.7	806	31.7
H	2065	81.3	2065	81.3
D	659	25.9	659	25.9
	kg	**lb.**	**kg**	**lb.**
Mass	303	668	454	1000

Standard E-Bypass
UL type 12, R7…R8



Standard E-Bypass, UL type 12, R7…R8				
Dimensions Ref.	**R7**		**R8**	
	mm	**in.**	**mm**	**in.**
W	806	31.7	806	31.7
H	2318	91.3	2318	91.3
D	659	25.9	659	25.9
	kg	**lb.**	**kg**	**lb.**
Mass	324	713	474	1045

Electrical Installation

Cable Entries ACH550 Vertical E-Bypass units are configured for wiring access from the bottom only. ACH550 Standard Mount E-Bypass units are configured for wiring access from the top. At least three separate metallic conduits are required, one for input power, one for output power to the motor and one for control signals.

Terminal Sizes Power and motor cable terminal sizes are shown in the Table 3-3 to Table 3-6 for connections to an input circuit breaker or disconnect switch, a motor terminal block and ground lugs. The table also lists torque that should be applied when tightening the terminals.

Table 3-3 208 - 240 Volt, Vertical E-Bypass Power Terminal Data

208 - 240 Volt		Frame Size	Maximum Wire Size Capacities of Power Terminals				
HP	**Identification**		**Circuit Breaker**	**Disconnect Switch**	**Motor Terminal Block**	**Overload Relay**	**Ground Lugs**
1	ACH550-Vx-04A6-2	R1	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
1.5	ACH550-Vx-06A6-2	R1	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
2	ACH550-Vx-07A5-2	R1	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
3	ACH550-Vx-012A-2	R1	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
5	ACH550-Vx-017A-2	R1	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
7.5	ACH550-Vx-024A-2	R2	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
10	ACH550-Vx-031A-2	R3	#3 44 in/lbs	#4 18 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
15	ACH550-Vx-046A-2	R3	#3 44 in/lbs	#4 18 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
20	ACH550-Vx-059A-2	R3	#3 44 in/lbs	#4 18 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
25	ACH550-Vx-075A-2	R4	#3 44 in/lbs	#1/0 55 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs

Table 3-4 380 - 480 Volt, Vertical E-Bypass Power Terminal Data

380 - 480 Volt		Frame Size	Maximum Wire Size Capacities of Power Terminals				
HP	**Identification**		**Circuit Breaker**	**Disconnect Switch**	**Motor Terminal Block**	**Overload Relay**	**Ground Lugs**
1/1.5	ACH550-Vx-03A3-4	R1	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
2	ACH550-Vx-04A1-4	R1	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
3	ACH550-Vx-06A9-4	R1	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
5	ACH550-Vx-08A8-4	R1	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
7.5	ACH550-Vx-012A-4	R1	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
10	ACH550-Vx-015A-4	R2	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
15	ACH550-Vx-023A-4	R2	#3 44 in/lbs	#8 7 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
20	ACH550-Vx-031A-4	R3	#3 44 in/lbs	#4 18 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
25	ACH550-Vx-038A-4	R3	#3 44 in/lbs	#4 18 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
30	ACH550-Vx-044A-4	R4	#3 44 in/lbs	#4 18 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
40	ACH550-Vx-059A-4	R4	#3 44 in/lbs	#4 18 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
50	ACH550-Vx-072A-4	R4	#3 44 in/lbs	#1/0 55 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs

Table 3-5 208 - 240 Volt, Standard E-Bypass Power Terminal Data

208 - 240 Volt		Frame Size	Maximum Wire Size Capacities of Power Terminals				
HP	**Identification**		**Circuit Breaker**	**Disconnect Switch**	**Motor Terminal Block**	**Overload Relay**	**Ground Lugs**
1	ACH550-Bx-04A6-2	R1	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
1.5	ACH550-Bx-06A6-2	R1	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
2	ACH550-Bx-07A5-2	R1	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
3	ACH550-Bx-012A-2	R1	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
5	ACH550-Bx-017A-2	R1	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
7.5	ACH550-Bx-024A-2	R2	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
10	ACH550-Bx-031A-2	R3	#2/0 120 in/lbs	#2/0 120 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
15	ACH550-Bx-046A-2	R3	#2/0 120 in/lbs	#2/0 120 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
20	ACH550-Bx-059A-2	R3	#2/0 120 in/lbs	#2/0 120 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
25	ACH550-Bx-075A-2	R4	#2/0 120 in/lbs	#2/0 120 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
30	ACH550-Bx-088A-2	R4	300MCM 275 in/lbs	#1/0 70 in/lbs	250MCM 275 in/lbs	N/A	3 x #3/0 250 in/lbs
40	ACH550-Bx-114A-2	R4	300MCM 275 in/lbs	#1/0 70 in/lbs	250MCM 275 in/lbs	N/A	3 x #3/0 250 in/lbs
50	ACH550-Bx-143A-2	R6	300MCM 275 in/lbs	350MCM 200 in/lbs	250MCM 275 in/lbs	N/A	3 x #3/0 250 in/lbs
60	ACH550-Bx-178A-2	R6	300MCM 275 in/lbs	350MCM 200 in/lbs	400MCM 375 in/lbs	N/A	3 x #3/0 250 in/lbs
75	ACH550-Bx-221A-2	R6	350MCM 275 in/lbs	350MCM 200 in/lbs	400MCM 375 in/lbs	N/A	3 x #3/0 250 in/lbs
100	ACH550-Bx-248A-2	R6	350MCM 275 in/lbs	350MCM 200 in/lbs	400MCM 375 in/lbs	N/A	3 x #3/0 250 in/lbs

Table 3-6 380 - 480 Volt, Standard E-Bypass Power Terminal Data

380 - 480 Volt		Frame Size	Maximum Wire Size Capacities of Power Terminals				
HP	**Identification**		**Circuit Breaker**	**Disconnect Switch**	**Motor Terminal Block**	**Overload Relay**	**Ground Lugs**
1/1.5	ACH550-Bx-03A3-4	R1	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
2	ACH550-Bx-04A1-4	R1	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
3	ACH550-Bx-06A9-4	R1	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
5	ACH550-Bx-08A8-4	R1	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
7.5	ACH550-Bx-012A-4	R1	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
10	ACH550-Bx-015A-4	R2	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
15	ACH550-Bx-023A-4	R2	#6 13 in/lbs	#6 13 in/lbs	#6 13 in/lbs	N/A	#4 35 in/lbs
20	ACH550-Bx-031A-4	R3	#2/0 120 in/lbs	#2/0 120 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
25	ACH550-Bx-038A-4	R3	#2/0 120 in/lbs	#2/0 120 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
30	ACH550-Bx-044A-4	R4	#2/0 120 in/lbs	#2/0 120 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
40	ACH550-Bx-059A-4	R4	#2/0 120 in/lbs	#2/0 120 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
50	ACH550-Bx-072A-4	R4	#2/0 120 in/lbs	#2/0 120 in/lbs	#2/0 120 in/lbs	N/A	#2 50 in/lbs
60	ACH550-Bx-077A-4	R5	300MCM 275 in/lbs	#1/0 70 in/lbs	#2/0 53 in/lbs	N/A	3 x #3/0 250 in/lbs
75	ACH550-Bx-096A-4	R5	300MCM 275 in/lbs	#1/0 70 in/lbs	#2/0 53 in/lbs	N/A	3 x #3/0 250 in/lbs
100	ACH550-Bx-124A-4	R6	300MCM 275 in/lbs	350MCM 200 in/lbs	250MCM 275 in/lbs	N/A	3 x #3/0 250 in/lbs
125	ACH550-Bx-157A-4	R6	300MCM 275 in/lbs	350MCM 200 in/lbs	250MCM 275 in/lbs	N/A	3 x #3/0 250 in/lbs
150	ACH550-Bx-180A-4	R6	300MCM 275 in/lbs	350MCM 200 in/lbs	250MCM 275 in/lbs	N/A	3 x #3/0 250 in/lbs
200	ACH550-Bx-245A-4	R7	2 x 250MCM 275 in/lbs	2 x 250MCM 275 in/lbs	350MCM 350 in/lbs	N/A	5 Bus Bar holes (13/32” bolts)
250	ACH550-Bx-316A-4	R8	2 x 250MCM 275 in/lbs	2 x 250MCM 275 in/lbs	2 x 600MCM 500 in/lbs	N/A	5 Bus Bar holes (13/32” bolts)
300	ACH550-Bx-368A-4	R8	2 x 500MCM 275 in/lbs	2 x 500MCM 275 in/lbs	2 x 600MCM 500 in/lbs	N/A	5 Bus Bar holes (13/32” bolts)
350	ACH550-Bx-414A-4	R8	2 x 500MCM 275 in/lbs	2 x 500MCM 275 in/lbs	2 x 600MCM 500 in/lbs	N/A	5 Bus Bar holes (13/32” bolts)
400	ACH550-Bx-486A-4	R8	2 x 500MCM 275 in/lbs	2 x 500MCM 275 in/lbs	2 x 600MCM 500 in/lbs	N/A	5 Bus Bar holes (13/32” bolts)

Connection Points

Vertical E-Bypass

Figure 3-1 shows the Vertical E-Bypass wiring connection points. Refer to the ACH550-UH User's Manual for control connections to the drive.

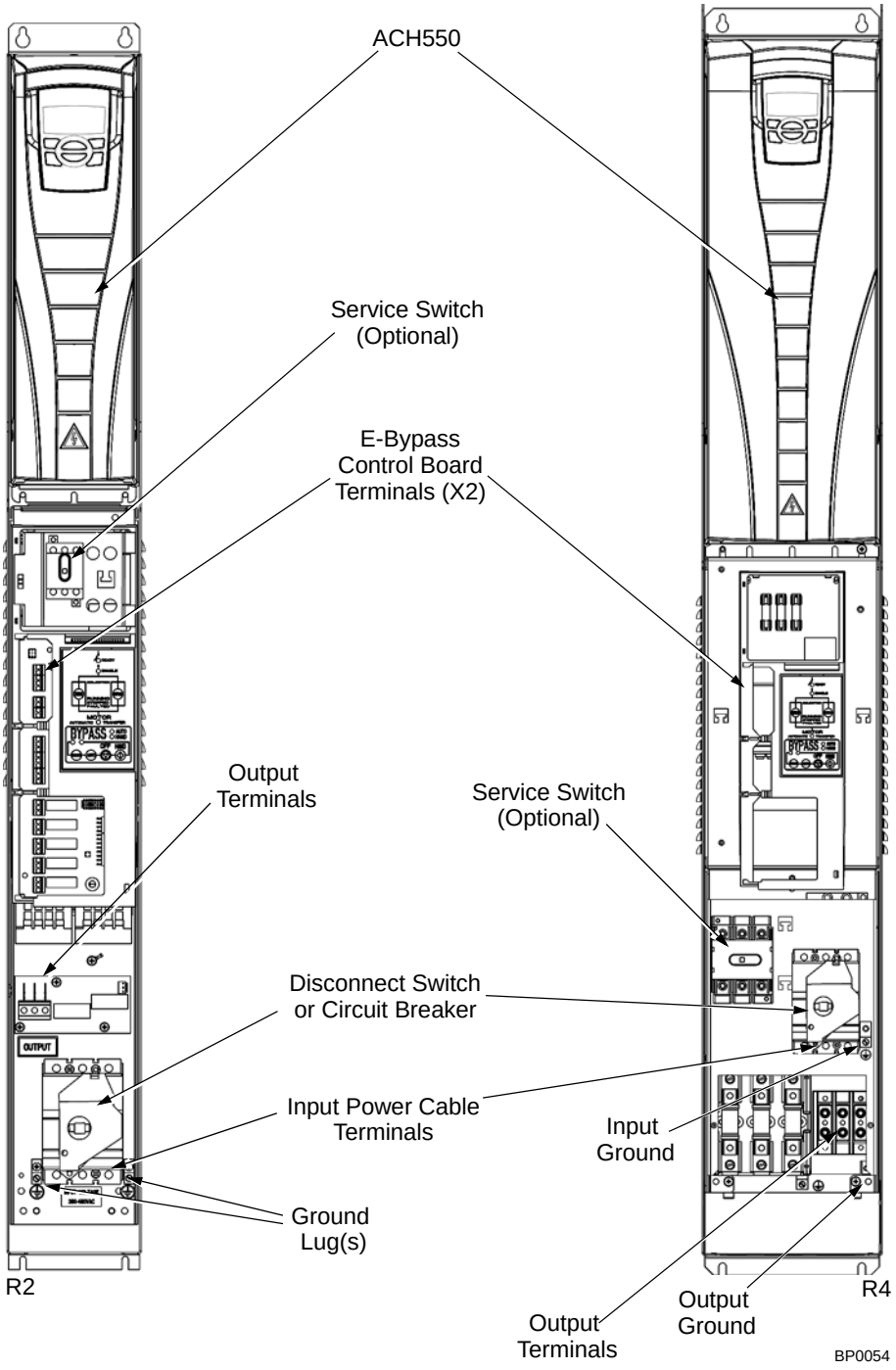


Figure 3-1 Wiring Connection Points – Vertical E-Bypass

Standard E-Bypass – Wall Mount

Figure 3-2 shows the Standard E-Bypass (wall mounted) wiring connection points. Refer to the ACH550-UH User's Manual for control connections to the drive.

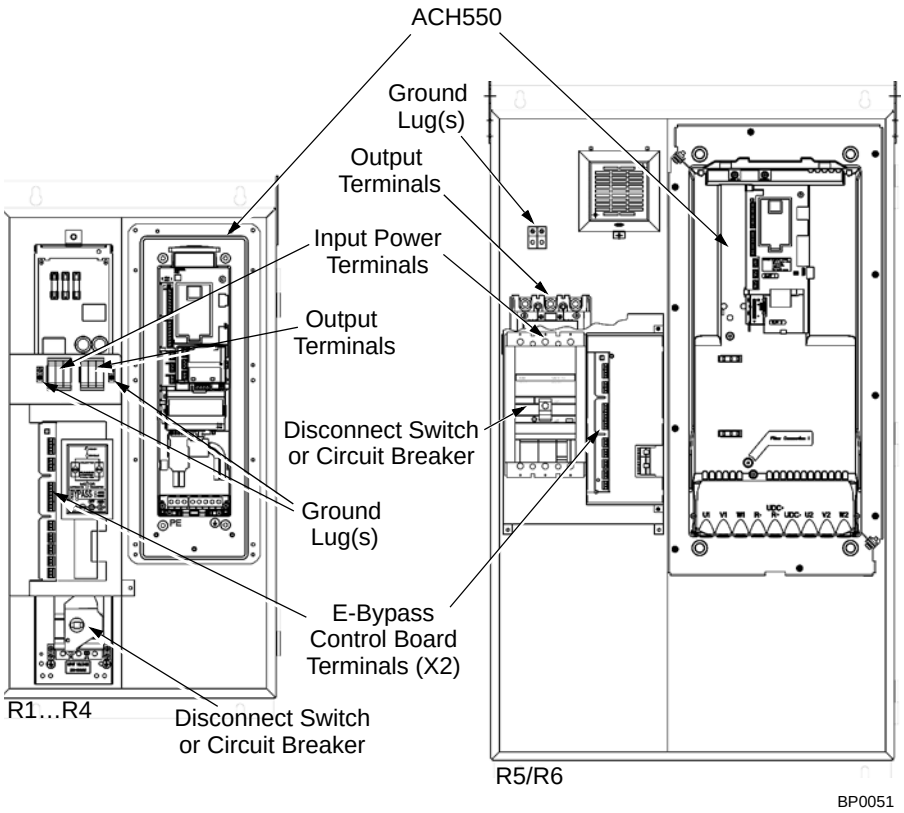


Figure 3-2 Wiring Connection Points – Standard E-Bypass (Wall Mount)

Standard E-Bypass – Floor Mount

Figure 3-3 shows the Standard E-Bypass (floor mounted) wiring connection points. Refer to the ACH550-UH User's Manual for control connections to the drive.

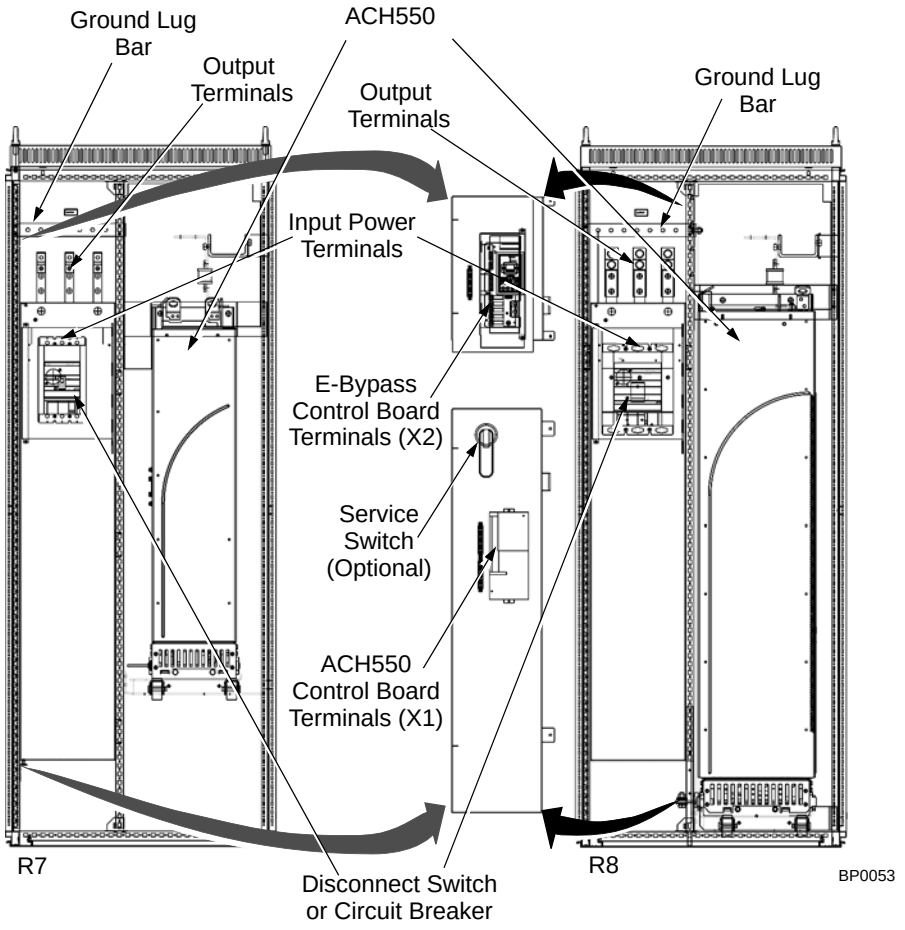


Figure 3-3 Wiring Connection Points – Standard E-Bypass (Floor Mount)

Input Wiring

Power wiring must conform to the requirements defined in "Wiring Requirements" on page 3-4.

When connected to a 480 VAC power source, the ACH550 with E-Bypass with the circuit breaker option is suitable for use on a circuit capable of delivering not more than 20,000 RMS symmetrical amperes (14,000 RMS symmetrical amperes for the 3 and 5 Hp models). When connected to a 240 VAC power source, the ACH550 with E-Bypass with the circuit breaker option is suitable for use on a circuit capable of delivering not more than 50,000 RMS symmetrical amperes.

WARNING!

- **Do not connect or disconnect input or output power wiring, or control wires, when power is applied.**
- **Never connect line voltage to drive output Terminals T1, T2, and T3.**
- **Do not make any voltage tolerance tests (Hi Pot or Megger) on any part of the unit. Disconnect motor wires before taking any measurements in the motor or motor wires.**
- **Make sure that power factor correction capacitors are not connected between the drive and the motor.**

Input Connections – Vertical E-Bypass Configurations

Connect the input power to the terminals at the bottom of the disconnect switch or circuit breaker as shown in Figure 3-4. Also see Figure 3-1. Connect the equipment grounding conductor to the ground lug near the input power connection point.

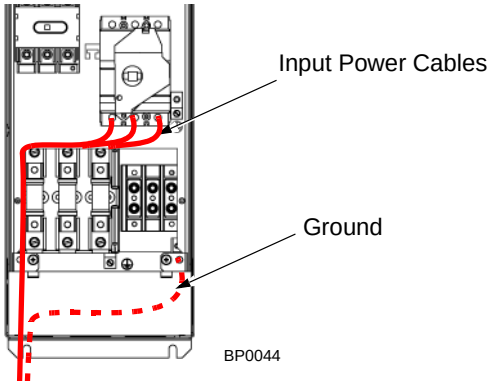


Figure 3-4 Input Power Wiring – Vertical E-Bypass

Input Connections – Standard E-Bypass Configurations

Connect input power to the terminals of the disconnect switch or circuit breaker. Connect the equipment grounding conductor to the ground lug at the top of the enclosure. Figure 3-5 shows the connection points for Standard E-Bypass configurations. Also see Figure 3-3 for R7 or R8.

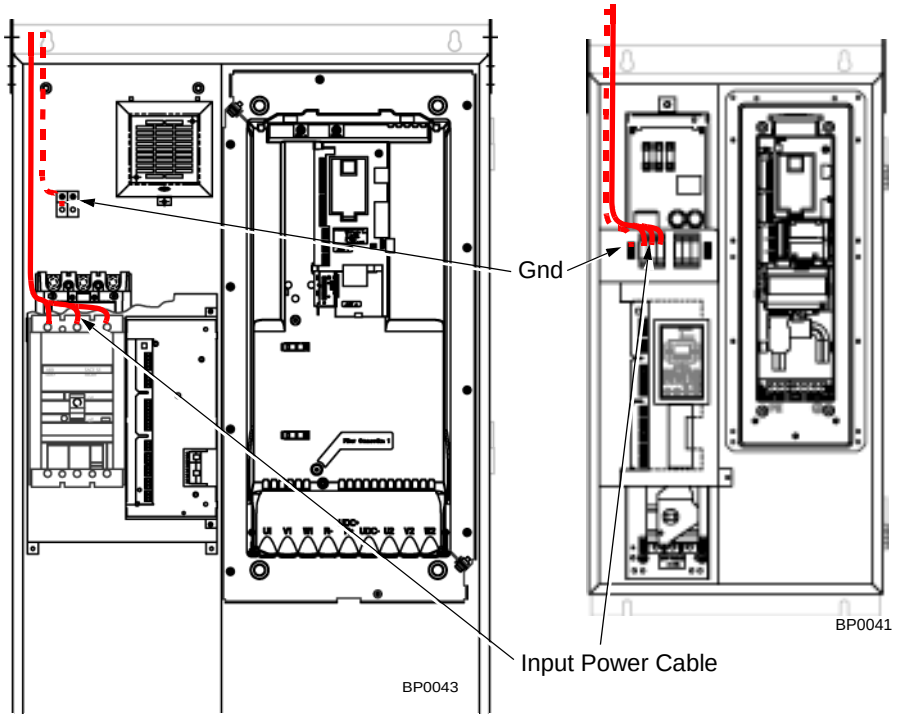


Figure 3-5 Input Power Wiring – Standard E-Bypass (Wall Mounted)

Output Wiring

Install the motor wiring away from other wire routes. Avoid long parallel runs with other wires. A dedicated metallic conduit should be provided from the drive to the motor for the output wiring.

WARNING! Check the motor and motor wiring insulation before connecting the ACH550 to line power. Follow the procedure provided below. Before proceeding with the insulation resistance measurements, check that the ACH550 is disconnected from incoming line power. Failure to disconnect line power could result in death or serious injury.

Checking Motor Wiring and Motor Insulation

1. Check that the motor wires are disconnected from the E-Bypass output on Terminals T1, T2, and T3.
2. Check that the motor wires are disconnected from the motor and remove bridging connections at the motor.
3. Measure the insulation resistances of the motor. The voltage range of the insulation resistance meter must be at least equal to the line voltage, but not exceeding 1000 V. The insulation resistance must be greater than 1 MΩ.
4. Measure the insulation resistance of the motor wiring between the phases and between each phase and ground. The insulation resistance must be greater than 1 MΩ.
5. Perform the Keypad Control Test before connecting the motor. Refer to "Keypad Control Tests" on page 4-6.

Motor Cable Length

The rapid rate of voltage changes causes capacitive coupling between motor wiring and the grounded metallic conduit. This phenomenon can cause substantially higher measured current than actual motor current, which may result in nuisance overcurrent trips or ground faults. Table 3-7 lists the maximum motor cable length based on capacitive coupling. It may also be necessary to consider motor insulation requirements related to drive output dv/dt.

Table 3-7 Maximum Recommended Motor Wire Lengths

Frame Size	Maximum Cable Length	
	Feet	Meters
R1	330	100
R2, R3, R4	660	200
R5, R6, R7, R8	990	300

Output Connections – Vertical E-Bypass Configurations

Connect the motor cables to the terminals at the bottom of the bypass section as shown in Figure 3-6. Also see Figure 3-1. Connect the motor grounding conductor to the ground lug near the motor cable terminal block connection point.

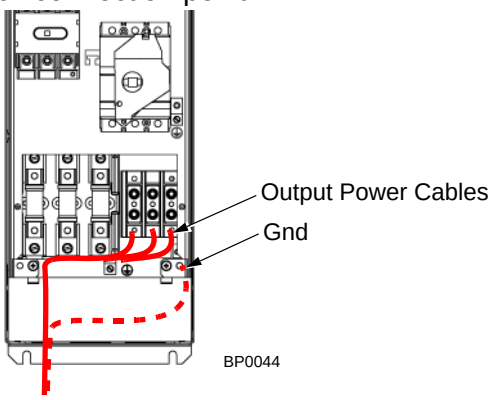
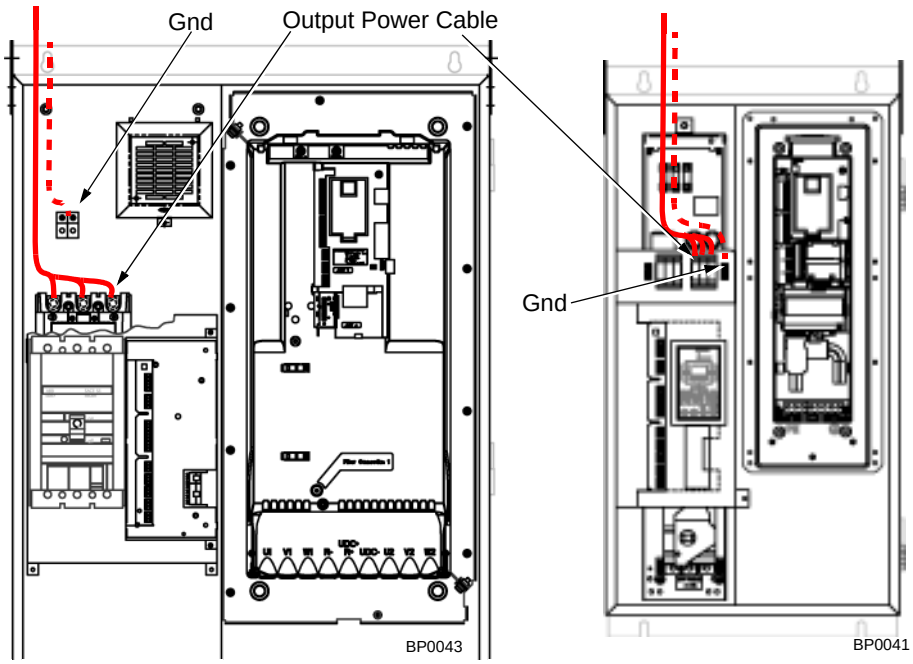


Figure 3-6 Output Power Wiring – Vertical E-Bypass

Output Connections – Standard E-Bypass Configurations

Connect the motor cables to the output terminal block as shown in Figure 3-7. Also see Figure 3-3 for R7 or R8. The motor grounding conductor can be connected to the ground lug near the terminal block.



Standard Configuration (R5, R6)

Standard Configuration (R1…R4)

Figure 3-7 Output Power Wiring – Standard E-Bypass (Wall Mounted)

Control Wiring

The control wiring includes connections to an analog speed command signal and a start/stop relay contact for controlling the motor in the AUTO mode. There may also be connections to external run enable interlock contacts and a connection from the Motor Run contact to an external status indicating circuit. For a detailed description of the control circuit functions, refer to the section entitled "Detailed Description of Operation" on page 2-5.

Connect Control Wires

Connect control wiring to terminal block X1 on the ACH550 control board and to terminal block X2 on the E-Bypass control board. Figure 3-1, Figure 3-2 and Figure 3-3 show the location of X2 for various configurations. Refer to the *ACH550-UH User's Manual* for the location of X1. X1 accepts one wire per terminal in wire sizes ranging from 22 AWG to 16 AWG and X2 accepts one wire per terminal in wire sizes ranging from 26 AWG to 14 AWG. Up to three wires per terminal can be connected with a proportional reduction in maximum wire size. The control terminals should be tightened to 4 inch-pounds of torque.

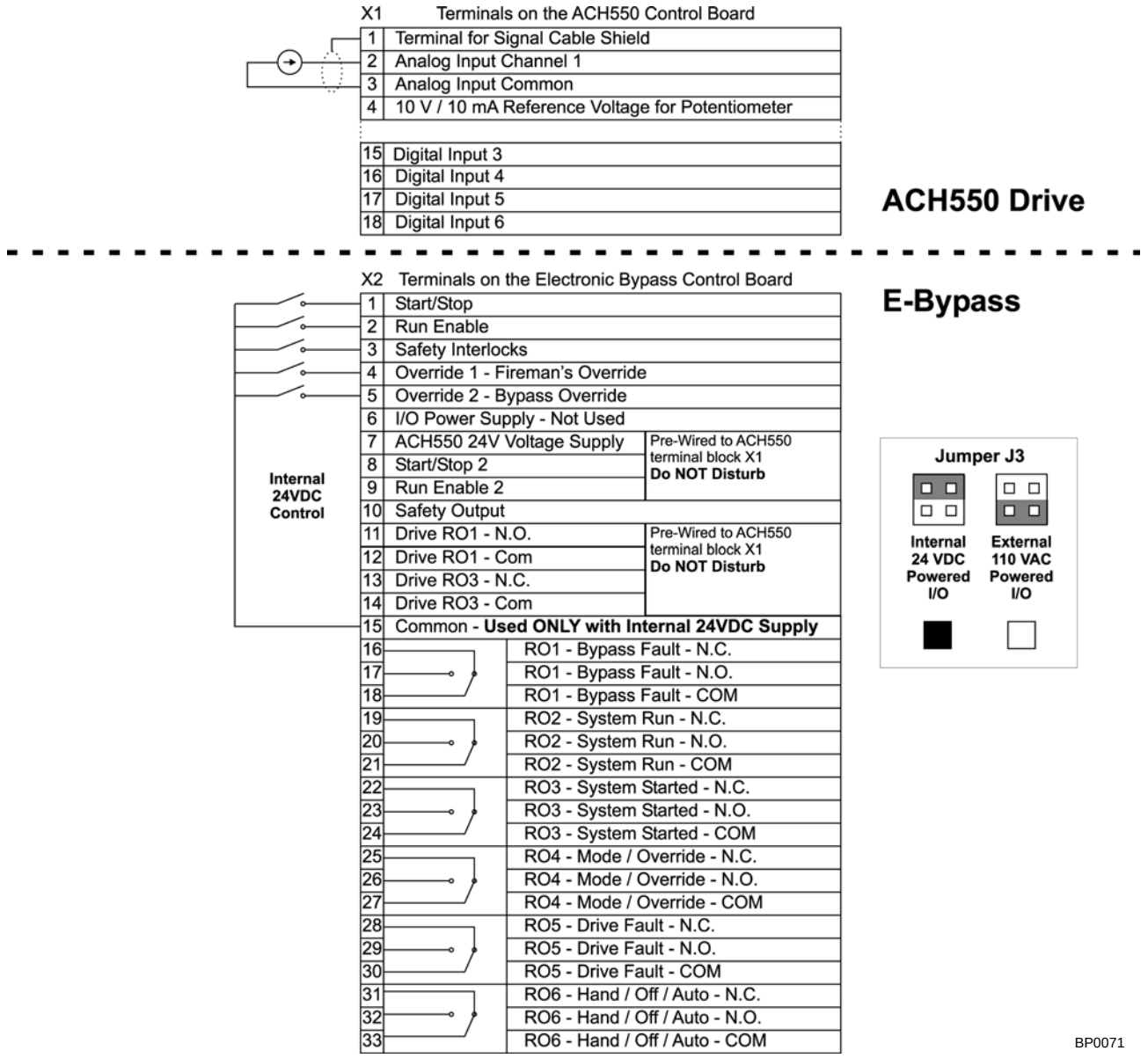
Basic Connections

Figure 3-8 shows the basic control connections for use with the E-Bypass macro. These connections are described in the following paragraphs.

Additional Connections

Analog inputs and outputs and additional digital input and relay output connections are available on Terminal Block X1 inside the ACH550. Note that the E-Bypass control circuitry uses inputs and outputs DI1, DI2, RO1 and RO3. These inputs and outputs are not available for any other purpose and must not be reconfigured. AI1, AI2, AO1, AO2, DI3, DI4, DI5, DI6 and RO2 are available for use. Refer to the *ACH550-UH User's Manual* for information about control connections on Terminal Block X1.

When making connections to Terminal Block X1, be careful not to disturb the factory installed wiring between ACH550 terminal block X1 and E-Bypass control board terminal X2.


X1 Terminals on the ACH550 Control Board
1 Terminal for Signal Cable Shield
2 Analog Input Channel 1
3 Analog Input Common
4 10 V / 10 mA Reference Voltage for Potentiometer
15 Digital Input 3
16 Digital Input 4
17 Digital Input 5
18 Digital Input 6
ACH550 Drive
X2 Terminals on the Electronic Bypass Control Board
E-Bypass
1 Start/Stop
2 Run Enable
3 Safety Interlocks
4 Override 1 - Fireman's Override
5 Override 2 - Bypass Override
6 I/O Power Supply - Not Used
7 ACH550 24V Voltage Supply
8 Start/Stop 2
9 Run Enable 2
Pre-Wired to ACH550 terminal block X1 Do NOT Disturb
Internal 24VDC Control
10 Safety Output
11 Drive RO1 - N.O.
12 Drive RO1 - Com
13 Drive RO3 - N.C.
14 Drive RO3 - Com
Pre-Wired to ACH550 terminal block X1 Do NOT Disturb
15 Common - Used ONLY with Internal 24VDC Supply
16 RO1 - Bypass Fault - N.C.
17 RO1 - Bypass Fault - N.O.
18 RO1 - Bypass Fault - COM
19 RO2 - System Run - N.C.
20 RO2 - System Run - N.O.
21 RO2 - System Run - COM
22 RO3 - System Started - N.C.
23 RO3 - System Started - N.O.
24 RO3 - System Started - COM
25 RO4 - Mode / Override - N.C.
26 RO4 - Mode / Override - N.O.
27 RO4 - Mode / Override - COM
28 RO5 - Drive Fault - N.C.
29 RO5 - Drive Fault - N.O.
30 RO5 - Drive Fault - COM
31 RO6 - Hand / Off / Auto - N.C.
32 RO6 - Hand / Off / Auto - N.O.
33 RO6 - Hand / Off / Auto - COM
Jumper J3
Internal 24 VDC Powered I/O
External 110 VAC Powered I/O
BP0071

Parameter Number	Description	Setting
1001	EXTERNAL 1 COMMANDS	1 (DI1)
1002	EXTERNAL 2 COMMANDS	1 (DI1)
1601	RUN ENABLE	2 (DI2)
1401	RELAY OUTPUT 1	7 (STARTED)
1403	RELAY OUTPUT 3	3 (FAULT (-1))

Figure 3-8 Basic Control Connections for E-Bypass Macro

Analog Input

One of the available analog inputs is usually used with the E-Bypass macro. The customer's external *Auto Speed Reference* is connected to ACH550 terminals X1:2(+) and X1:3(-).

The analog inputs can accept a voltage signal (0 – 10 VDC) or a current signal (0 – 20 mA). Switch J1, located on the ACH550 control board (J1 is used for both AI1 and AI2), determines the signal type. Set J1 to either the voltage or current position according to the type of external signal that will be connected. Figure 3-9 shows switch positions. To locate J1, refer to the ACH550-UH User's Manual, or, for R7 and R8, refer to Figure 3-3.

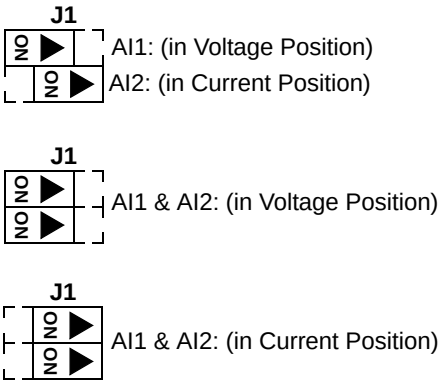


Figure 3-9 ACH550 J1 Position Examples

Caution: There are pre-wired connections on bypass terminals X2:7 through X2:9 and X2:11 through X2:14. Do not disturb these connections when adding external wiring connections.

Bypass Control Board Relay Contact Inputs

Start/Stop Input Contact

To start the ACH550 by dry contact (maintained), connect the contact between bypass terminals X2:1 and X2:15. Closing this contact will start the system when the drive or bypass is in the *Auto* mode provided the *Safety Interlock* input is closed.

Run Enable Input Contacts

Run Enable permissives, such as damper end switches are normally closed dry contacts connected in series between bypass terminals X2:2 and X2:15. When any of these contacts opens, the motor will stop and the *System Run* relay will de-energize, whether in DRIVE or BYPASS.

Safety Interlock Input Contacts

*Safety Interlock*s, such as Freeze, Fire, and Smoke protection are normally closed dry contacts connected in series between bypass terminals X2:3 and X2:15. When any of these contacts opens, the motor will stop and the *System Started & System Run* relays will de-energize, whether in DRIVE or BYPASS.

Fireman's Override (Override 1) Contact

Fireman's Override is designed for *"***Run to Destruction***"* operation. See "Fireman's Override Mode" on page 2-8 for a description of this mode.

Connect the *Fireman's Override* contact between bypass terminals X2:4 and X2:15.

Bypass Override (Override 2) Contact

If the *Bypass Override (Override 2)* input contact is closed, the system is forced to the *Bypass Override* mode. See "Bypass Override Mode" on page 2-8 for a description of this mode.

Connect the *Bypass Override* contact between bypass terminals X2:5 and X2:15.

Caution: There are pre-wired connections on bypass terminals X2:7 through X2:9 and X2:11 through X2:14. Do not disturb these connections when adding external wiring connections.

Bypass Control Board Relay Contact Outputs

Drive Fault

Form C contacts of a Drive Fault relay are provided at bypass terminals X2:28(NC), X2:29(NO) and X2:30(COM). The drive fault relay is energized when the drive is energized and not faulted.

System Run

Form C contacts of a *System Run* relay are provided at bypass terminals X2:19(NC), X2:20(NO) and X2:21(COM). The *System Run* relay is energized when the E-Bypass System is running. The *System Run* relay provides an output when the motor is running whether powered by the ACH550 drive or the bypass.

Separate normally open *Drive Run* and *Bypass Run* contacts can be created by using the *System Run* relay with the *Mode / Override* relay. This is done by using X2:21(COM) and connecting X2:20(NO) to X2:27(COM). X2:25(NC) becomes the *Drive Run* contact and X2:26(NO) becomes the *Bypass Run* contact. This configuration provides outputs that are closed when the motor is running. To do this the *Mode / Override* relay must be configured for *Mode* relay operation. See "E-Bypass Jumper, Switch and Pot Settings" on page 4-2.

System Started

Form C contacts of a *System Started* relay are provided at bypass terminals X2:22(NC), X2:23(NO) and X2:24(COM). Three conditions must be met in order for the relay to energize.
1) a *Start* command must be present.
2) the *Safety Interlock* input contact must be closed and
3) there can be no fault present in the system.

The *System Started* relay is ideal for use in damper actuator circuits.

Mode/Override

Form C contacts of a *Mode* / *Override* relay are provided at bypass terminals X2:25(NC), X2:26(NO) and X2:27(COM). The *Mode* / *Override* relay is a configurable relay. The function of the relay is selectable between *Mode* and *Override* operation. If the *Mode* / *Override* relay is configured for *Mode* operation (Default), the relay is energized when the *Bypass* mode is selected and de-energized when the *Drive* mode is selected. If the *Mode* / *Override* relay is configured for *Override* operation, the relay is energized when the *Override* mode is selected and de-energized in all other modes. See "E-Bypass Jumper, Switch and Pot Settings" on page 4-2.

Bypass Fault

Form C contacts of a Bypass Fault relay are provided at bypass terminals X2:16(NC), X2:17(NO) and X2:18(COM). The *Bypass Fault* relay is energized when the bypass is energized and not faulted and the underload/overload protection is reset.

Hand/Off/Auto

Form C contacts of a *Hand/Off/Auto* relay are provided at bypass terminals X2:31(NC), X2:32(NO) and X2:33(COM). The *Hand/Off/Auto* relay is energized when the bypass is in the *Auto* mode and de-energized in the *Hand* mode and when the bypass is *Off*.

Relay Contact Ratings

The relay contact ratings are:

Maximum Voltage: 30 VDC / 125 VAC

Maximum Switching Current: 8 A at 24 VDC, 0.4 A at 125 VAC

Maximum Continuous Current: 2 A rms

If the relay contacts are used to control inductive loads, such as the coils of relays or contactors, some form of noise suppression must be provided at the load. This is to reduce the electrical noise that could interfere with the electronics in the drive, as well as increase the life of the contacts in the relay.

DC coils should be suppressed with a diode, although this is not required because of the small amount of noise generated by these type of circuits. If a diode is used, it should have a voltage rating greater than or equal to the supply voltage rating.

Wiring Practices

The external control wiring to X1 and X2 must not be run in the same metallic conduit or raceway with any high power wiring. The external speed reference signal must be wired using a twisted pair shielded cable. The shield connection must be terminated at the ground terminal provided (X1:1). The other end of the shield should be cut and taped back at the signal source.

Chapter 4 – Start-up Procedure

This chapter explains how to inspect the installation and how to start up the ACH550 with E-Bypass.

Safety Precautions

Before start-up, read and follow the precautions listed below.

- After the supply voltage is disconnected from the input, the DC Bus capacitors should discharge to a safe voltage in about five minutes.
- To ensure that the voltage level is safe, measure the voltage between the DC Bus terminals, UC+ and UC- inside the ACH550 drive unit. The testing meter must be rated for 1000 VDC.

WARNING! When the ACH550 with E-Bypass is connected to the line power, the Motor Terminals T1, T2, and T3 are live even if the motor is not running. Do not make any connections when the ACH550 with E-Bypass is connected to the line. Disconnect and lock out power to the drive before servicing the drive. Failure to disconnect power may cause death or serious injury.

Installation Inspection

Inspect the mechanical and electrical installation of the ACH550 with E-Bypass for compliance with your local electrical installation regulations and codes.

Note: Do not connect the motor wires before proceeding with the Keypad Control Test with Motor Disconnected. Refer to Keypad Control Tests in this chapter.

After installation, inspect the following:

- ACH550 with E-Bypass and motor grounding.
- Supply and motor wire size and connections.
- Control cable connections, wire shield grounding, and control cable location away from the power wires.
- Quantity and quality of cooling air for the ACH550 with E-Bypass.

Connect the ACH550 with E-Bypass to supply voltage. Check that the voltage between $L_1 – L_2$, $L_1 – L_3$, and $L_2 – L_3$ is $V_N \pm 10\%$.

Refer to "Chapter 3 – Installation Instructions" in this manual for detailed installation instructions and requirements.

E-Bypass Jumper, Switch and Pot Settings

Figure 4-1 shows the locations of the jumpers, DIP switch and potentiometers on the E-Bypass control board. The functions and settings of these items are explained in the following paragraphs.

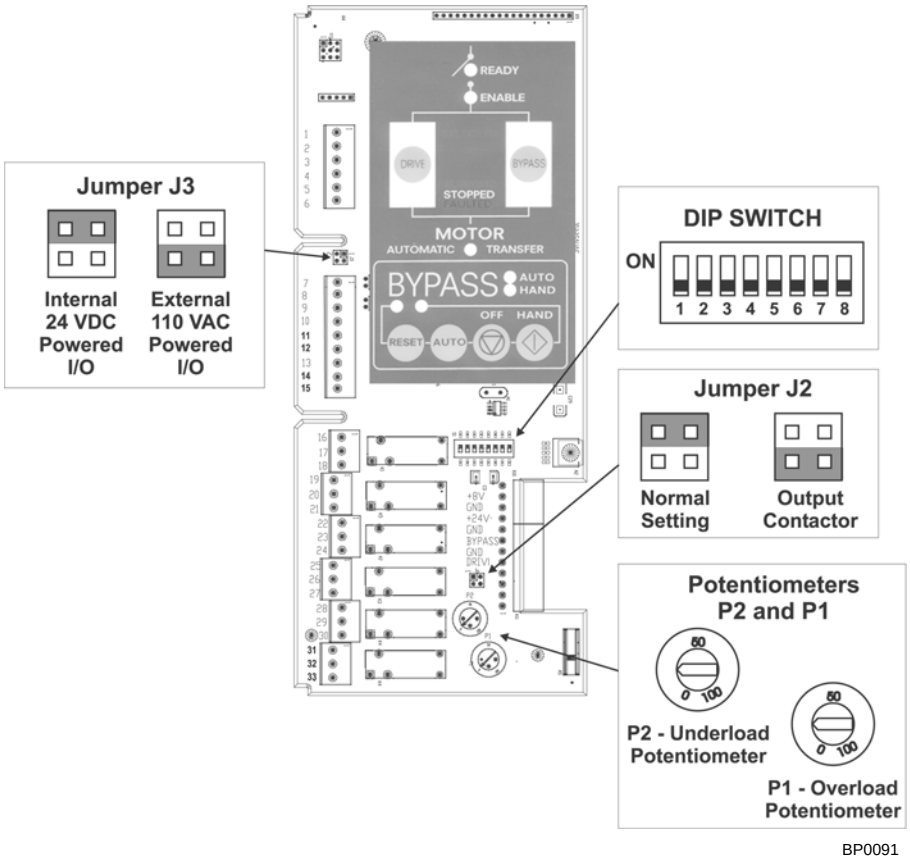


Figure 4-1 E-Bypass Control Board

DIP Switch Settings

The DIP switch is used to configure the bypass overload protection, select the *Mode / Override* relay's function and enable the automatic bypass feature. Match the DIP Switch Codes to your drive model using Table 4-1 or Table 4-2 and Table 4-3.

Table 4-1 208 - 240 Volt, Codes for Overload Trip Current DIP Switch

208 - 240 Volt			
HP	**Identification**	**Frame Size**	**Switch Code**
1	ACH550-xx-04A6-2	R1	A
1.5	ACH550-xx-06A6-2	R1	A
2	ACH550-xx-07A5-2	R1	A
3	ACH550-xx-012A-2	R1	A
5	ACH550-xx-017A-2	R1	B
7.5	ACH550-xx-024A-2	R2	B
10	ACH550-xx-031A-2	R3	C
15	ACH550-xx-046A-2	R3	D
20	ACH550-xx-059A-2	R3	D
25	ACH550-xx-075A-2	R4	D
30	ACH550-xx-088A-2	R4	F
40	ACH550-xx-114A-2	R4	F
50	ACH550-xx-143A-2	R6	G
60	ACH550-xx-178A-2	R6	G
75	ACH550-xx-221A-2	R6	G
100	ACH550-xx-248A-2	R6	G

Table 4-2 208 - 240 Volt, Codes for Overload Trip Current DIP Switch

208 - 240 Volt			
HP	**Identification**	**Frame Size**	**Switch Code**
1	ACH550-xx-04A6-2	R1	A
1.5	ACH550-xx-06A6-2	R1	A
2	ACH550-xx-07A5-2	R1	A
3	ACH550-xx-012A-2	R1	A
5	ACH550-xx-017A-2	R1	B
7.5	ACH550-xx-024A-2	R2	B
10	ACH550-xx-031A-2	R3	C
15	ACH550-xx-046A-2	R3	D
20	ACH550-xx-059A-2	R3	D
25	ACH550-xx-075A-2	R4	D
30	ACH550-xx-088A-2	R4	F
40	ACH550-xx-114A-2	R4	F
50	ACH550-xx-143A-2	R6	G
60	ACH550-xx-178A-2	R6	G
75	ACH550-xx-221A-2	R6	G
100	ACH550-xx-248A-2	R6	G

Table 4-3 DIP Switch Settings

Switch Position	**Switch Setting Configurations**							
	Switch Code							
	A	**B**	**C**	**D**	**E**	**F**	**G**	**H**
1	(OFF) / ON = Automatic Transfer Bypass Feature (OFF) / ON							
2	(OFF) / ON = Mode / Override Relay RO4 (Mode) / Override							
3	RESERVED (OFF)							
4	OFF / (ON) = NEMA Class 30 / (NEMA Class 20) overload trip curve							
5	RESERVED (OFF)							
6	OFF	OFF	OFF	OFF	ON	ON	ON	ON
7	OFF	OFF	ON	ON	OFF	OFF	ON	ON
8	OFF	ON	OFF	ON	OFF	ON	OFF	ON

Default settings in (parentheses).

Output Contactor Control

In the unlikely event of failure in the bypass control electronics, the user can engage the drive output contactor without the control electronics by moving jumper J2 to the position as shown in Figure 4-1. When the jumper is in the *Output Contactor* position, the *Drive* contactor is energized and the *Bypass* contactor is de-energized. The contactors, and therefore the system, are not controlled by the bypass electronics when jumper J2 is in the *Output Contactor* position. The system is incapable of Bypass or Override operation in this configuration.

Overload Trip Current Adjustment Potentiometer

The overload protection trip current must be adjusted to the motor nameplate current using the P1 adjustment potentiometer located in the lower right hand area of the bypass control board as shown in Figure 4-1. Table 4-4 shows the trip currents for the various frame sizes for potentiometer settings of 10 to 100.

Table 4-4 Overload Trip Current Potentiometer Settings

Potentiometer Setting	Overload Trip Current (Values in Amps)							
	Switch Code							
	A	B	C	D	E	F	G	H
10	1.2	2.5	3.8	7.5	10.4	15.5	30.0	48.8
20	2.4	5.0	7.6	15.0	20.8	31.0	60.0	97.6
30	3.6	7.5	11.4	22.5	31.2	46.5	90.0	146.4
40	4.8	10.0	15.2	30.0	41.6	62.0	120.0	195.2
50	6.0	12.5	19.0	37.5	52.0	77.5	150.0	244.0
60	7.2	15.0	22.8	45.0	62.4	93.0	180.0	292.8
70	8.4	17.5	26.6	52.5	72.8	108.5	210.0	341.6
80	9.6	20.0	30.4	60.0	83.2	124.0	240.0	390.4
90	10.8	22.5	34.2	67.5	93.6	139.5	270.0	439.2
100	12.0	25.0	38.0	75.0	104.0	155.0	300.0	488.0

Underload Trip Current Adjustment Potentiometer

The underload protection trip current must be adjusted to a percentage of the motor nameplate current using the P2 adjustment potentiometer located in the lower right hand area of the bypass control board as shown in Figure 4-1. Potentiometer settings are adjustable from 0 to 100% of the P1 (overload trip) setting. The default setting is 0% which effectively removes the underload protection trip feature from the system.

Circuit Breaker Settings

The circuit breakers on ACH550 E-Bypasses with output ratings above 120 amps have adjustable switch settings for instantaneous and overload current protection. The factory default settings are practical for most applications. Refer to the *ABB SACE Instruction Sheet* supplied with your equipment for additional information on the adjustment of these settings.

Macros and Parameter Settings

Apply power to the E-Bypass unit. The display should show the operating status of the drive. If the motor is a standard 208 V, 60 Hz motor connected to a 208 V drive or a 480 V, 60 Hz motor connected to a 480 V drive, the default parameter settings should be suitable for the initial tests described below. If the motor's rating is not 208 V or 480 V, 60 Hz, the MOTOR NOM VOLT and MOTOR NOM FREQ parameters will need to be properly set before proceeding. Refer to the *ACH550-UH User's Manual* and set the parameters as required.

The only macro that provides the proper configuration settings by default is the E-Bypass macro. If any other macro will be used, the selected macro can be set after completing the initial tests. When using any other macro the following parameter values must be set or portions of the E-Bypass will not function properly:

- Parameter 1001 must be set to "DI1"
- Parameter 1002 must be set to "DI1"
- Parameter 1601 must be set to "DI2"
- Parameter 1401 (RO1) must be set to "Started"
- Parameter 1403 (RO3) must be set to "Fault (-1)"

Refer to the *ACH550-UH User's Manual* for additional information.

Keypad Control Tests

Motor Disconnected from the ACH550 with E-Bypass

After setting the Start-up Data parameters, test and become familiar with the operation of the ACH550 Drive with E-Bypass without the motor connected as follows:

1. Disconnect and lock out power to the E-Bypass unit, wait at least five minutes after disconnecting power.
2. Disconnect the motor from the E-Bypass unit.
3. Apply power to the E-Bypass unit by turning on the branch circuit disconnect device and the bypass disconnect switch or circuit breaker.
4. The ACH550 Control Panel display should be illuminated. On the bypass keypad, the *Ready* LED and *Enable* LED should be illuminated. If the *Enable* LED is not illuminated, check to see that closed contacts or jumpers connect terminal X2:2 and X2:3, on the bypass control board, to terminal X2:15.
5. Either the *Drive Selected* or *Bypass Selected* LED should be illuminated. Pressing the *Drive Select* or *Bypass Select* key should switch the bypass back and forth between the *Drive* mode and the *Bypass* mode as indicated by the LEDs above each button. Check that the bypass keypad switches the system between modes. Leave the system in the Bypass mode when proceeding to the next step.

6. Check to see that pressing the *Auto* key on the bypass keypad causes the *Auto* LED to be illuminated, pressing the Hand key causes the *Hand* LED to be illuminated and pressing the *OFF* key causes either the *Hand* or *Auto* LED to go off. Leave the *Hand* and *Auto* LEDs off when proceeding to the next step.
7. For Steps 8 through 13 Parameter 9904 must be set to "Scalar:Freq". After successful completion of Step 12, Parameter 9904 may be set to "Vector:Speed" if very specific application requirements make it necessary to use this type of motor control. Operation using the "Vector:Speed" setting is unnecessary for control of almost all fan and pump applications. Refer to the *ACH550-UH User's Manual* for details on setting parameters.
8. Press the *Drive Select* key on the bypass keypad. The *Drive Select* LED should be illuminated.
9. Press the *HAND* key on the ACH550 keypad. Note that the bottom line of the display indicates "HAND" and "RUN" and a Right Arrow. The *Drive Run* LED on the Bypass keypad should be illuminated.
10. Press the UP arrow. Note that the reference frequency indication in the top line of the display increases from "0.0 Hz." The large actual output frequency indication in the center line of the display should also increase from "0.0 Hz."
11. In the top line of the display, the output current indication should indicate "0.0 A" and the torque indication should indicate "0%."
12. Press the DOWN arrow until the frequency indications return to "0.0 Hz"
13. Press the OFF key. Note that the bottom line of the display indicates "Off."

If the ACH550 Drive and E-Bypass operate according to these steps, disconnect and lock out power to prepare for the next test.

WARNING! Wait at least five minutes after disconnecting power from the drive before you attempt to service the drive. Bus capacitors in the intermediate DC circuit must discharge before servicing the drive. Check for zero volts at Terminals UC+ and UC-. Meter must be rated for 1000 VDC.

If the drive does not operate according to these steps, refer to the *ACH550-UH User's Manual.*

Motor Connected to the E-Bypass

After successfully testing the drive with the motor disconnected, continue testing the drive as follows:

1. Disconnect and lock out power to the E-Bypass unit.
2. Connect the motor to the output terminals.

CAUTION: If the Fireman's Override (Override 1) input contact is closed the motor will start across the line as soon as power is applied.
If the Safety Interlock and Run Enable input contacts are closed and the Bypass Override (Override 2) input contact is closed the motor will start across the line as soon as power is applied.

If the Start/Stop, Safety Interlock and Run Enable input contacts are closed and the system is in the Bypass mode and in either Hand or Auto, the motor will start across the line as soon as power is applied.

If the Start/Stop, Safety Interlock and Run Enable input contacts are closed and the system is in the Drive mode with the drive in either Hand or Auto mode, the motor will start on the drive as soon as power is applied.

In order to prevent the motor from starting, the system should be in the Drive mode and the drive should be OFF when the power is disconnected at the end of the previous series of tests with the motor disconnected.

In order to prevent the motor from running without disconnecting the motor, open the Run Enable and Safety Interlock contacts on bypass control board terminals X2:2, X2:3 and X2:4 before applying power. Set the bypass to Drive mode and the drive to OFF.

3. Apply power to the E-Bypass unit.
4. Press the *Hand* key on the ACH550 control panel.

CAUTION: Check motor rotation direction as soon as the motor begins to move. If motor does not rotate in the correct direction, shut down the drive, disconnect and lock out power to the drive and wait five minutes. Swap any two motor output wires (T1, T2, and T3). Incorrect motor rotation direction may cause equipment damage.

5. Slowly increase the output frequency by pressing the UP ARROW key. Verify that motor speed varies as frequency varies.
6. Increase the speed to 60 Hz or the highest safe operating speed.
7. Measure the output current in all three phases. The current should be balanced, and should not exceed the motor or drive rating.
8. Press the *OFF* key on the ACH550 control panel. The motor should stop.

CAUTION: Check the motor rotation direction in bypass.

Press the OFF key and then the Bypass Select key on the bypass keypad. Press the Hand key and then quickly press the OFF key to "bump" the motor. If the motor turns in the wrong direction, swap any two input power leads at the disconnect switch. Do not swap the motor leads.

If the drive does not operate according to these steps, refer to the *ACH550-UH User's Manual*.

If the drive operates according to these steps, your ACH550 with E-Bypass is ready to use with preset or modified macro settings. Refer to the *ACH550-UH User's Manual* for programming instructions.

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